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**ENGINEERING TERMINOLOGY**  
DEFINITIONS OF  
TECHNICAL WORDS AND PHRASES



# Engineering Terminology

## Definitions of Technical Words and Phrases

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## PREFACE TO SECOND EDITION

The first edition of this book sold out rapidly. In revising we tried to make corrections in line with constructive criticism received. Many words and some appendix material were added from Report No. 474, "Nomenclature for Aeronautics," by the "National Advisory Committee for Aeronautics." Credit is also due to the National Resources Committee for appendix material entitled, "Suggested Symbols for Plans, Maps and Charts," as well as to the American Shore and Beach Preservation Association for certain terms.

In reviewing the first edition, many technical and engineering publication editors furnished, unknowingly, moral force to assist us in pushing this revision. This book has been well received. We know it is not complete. However, we are continually collecting words and phrases, and, as time proceeds, we expect to enlarge and revise.

Again let us say we appreciate constructive criticism and are always glad to receive your new words and definitions.

*V. J. Broten*

*D. G. Runner*



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# A

**Aa**—A Hawaiian word for rough, scoriaceous lava.

**A.A.N.**—The American Association of Nurserymen.

**Abaco**—A Mexican word for a stone trough used to wash minerals.

**Abacus**—In architecture, the topmost slab or division of the capital of a column. In the Greek Doric, square. In all other orders it is built up of mouldings.\*

**Abate**—In metal working, to lower the temperature.

**Abattis**—A mining term for the cross-packing of branches or rough wood, used to keep roads open for ventilation.

**Abbreviations of Major Technical Societies and Associations**—(See Technical societies.)

**Aberration, Chromatic**—(See chromatic aberration.)

**Ablation**—The formation of residual deposits by the washing away of loose or soluble minerals.

**Abney Level**—A hand level with a clinometer attachment.

**Abnormal Profile (soils)**—A term used in soil conservation work to denote a profile departing from the normal, typical or regional profile conditions in some important respects, by reason of some unusual change in the factors governing weathering. Abnormal profiles might be caused by excessive erosion following the removal of vegetation cover by fires, by changes in drainage conditions due to natural or artificial causes, or by any action which might change the natural weathering conditions.

**Abra**—A Spanish word for fissure in a lode, unfilled or only partially filled.

**Abradant**—An abrading substance, as emery, sand, etc., used in grinding and polishing.

**Abrasion**—The act of wearing or rubbing off or away by friction or attrition.

**Abrasive**—A substance used for abrading, as for grinding and polishing. The chief substances used as abrasives are: burstone, corundum, emery, garnet, grindstone, infusorial earth, millstone, novaculite, oilstone, pumice, tripoli, volcanic ash, and whetstone.

**Absolute Atmosphere**—An absolute unit of pressure, equal to one million times the pressure produced on a square centimeter by the force of one dyne.

—**Altitude**—The height of an aircraft above the earth.

—**Angle of Attack**—The angle of attack of an airfoil, measured from the attitude of zero lift.

—**Ceiling**—The maximum height above sea level at which a given airplane would be able to maintain horizontal flight under standard air conditions.

—**Humidity**—Mass of water vapor present in the atmosphere measured as grams per cubic meter.

—**Pressure**—The existing atmospheric pressure plus the gauge reading pressure; i. e., pressure reckoned from a vacuum; commonly expressed in absolute atmospheres.

—**Temperature (centigrade scale)**—The reading of the thermometer in degrees centigrade plus 273 degrees.

—**Temperature (Fahrenheit scale)**—The reading of the thermometer in degrees Fahrenheit plus 460 degrees.

—**Units**—The centimeter, the gram, the second of the C.G.S. system of measurement are called the absolute units.

—**Zero**—The temperature at which a gas would show no pressure if the

general law for gases should hold for all temperatures. It is equal to  $-273.13^{\circ}\text{C.}$  or  $-459.4^{\circ}\text{F.}$

**Absorbing Well**—An excavation in the earth through which surface water finds its way to a permeable stratum and is drained away.

—In physical geography, the processes by which air or water enter the lithosphere, the latter either as vapor or liquid. The absorption of water includes inflow of atmospheric water-vapor, hygroscopic adsorption, wetting, infiltration, influent seepage, and gravity flow of streams into sinkholes or other large openings.

**Absorption**—In wood preservation, the amount of preservative taken up by, or forced into, timber during treatment.

—Amount of moisture or other liquid taken up by capillarity.

—**Gross**—In wood preservation, the total amount of preservative injected into wood during the treating operation.

—**Initial**—In wood preservation, the amount of preservative absorbed by the wood while the retort is being filled.

—**Loss**—In soil erosion work and hydraulics, the loss of water from a canal or reservoir by capillary action and percolation during the process of priming. After a canal or reservoir has reached a stable condition this loss is called "seepage."

—**Net**—In wood preservation, the amount of preservative left in the wood after completion of the treating operation.

—**Volumetric**—In wood preservation, the ratio of the volume of preservative solution absorbed to the total volume of the timber.

**Absortivity, Acoustic**—(See acoustic absorptivity.)

**Abstract**—In general, a summary of the more pertinent items in a document or documents.

—**Of Title**—A condensed history of the title to land.

**Abutment**—A supporting wall carrying the end of a bridge or span and generally sustaining the pressure of the abutting earth. The abutment of an arch is sometimes called a bench wall.

**Abysmal Sea**—That part of the sea which occupies the ocean basins proper.

**Acanthus**—In architecture, a plant whose leaves are, in a conventional manner, used to form the lower portions of the Composite and Corinthian capitals.\*

**Accelerated Erosion**—A soil conservation term referring to the erosion taking place at a greater rate than the geologic norm. Erosion which has been increased above that which existed under natural environment either as a result of the destruction of vegetative cover or by some activity of man.

**Acceleration**—The time rate of change of velocity in either speed or direction, measured by the change in unit time. CGS unit—one centimeter per second per second.

**Accelerator**—In the case of stucco, plaster, mortar, concrete, etc., a substance which will hasten the set.

**Accelerometer**—An instrument that measures the accelerations of an aircraft in a defined direction.

**Accessory Minerals (rock)**—These are original constituents of the rock, found only in small, often only in microscopic quantity.

**Account**—A statement required to enable payment to be made for labor performed, material furnished, or to establish the detail and total cost of work or class of expenses.

**Accounting Adjustment**—A restating of an amount in the accounts of an enterprise by changing the amount

or transferring to another account or accounts.

—**Report**—A statement compiled and published by the Interstate Commerce Commission, showing the financial history of a railway and a re-statement of its accounts as of a stated date of valuation.

**Accretion**—The process by which inorganic bodies grow larger, by the addition of fresh particles to the outside.

**Accumulating Electricity**—The act of charging an electric current into storage battery cells for use at some future time.

**Accumulator**—In electricity, a name for a storage battery.

**Accuracy**—Nearness to the truth. (It embodies the notion of care, or painstaking and is not to be confused with Precision.) Example: A measured length read to thousandths of a foot is more precise than if read to hundredths of a foot only. However, if the first measurement contains an error of several hundredths, due, for example, to failure to allow for erroneous length of tape, or to uncorrected temperature error, it may be much less accurate than the second, if in the latter an attempt has been made to correct for these errors. (In estimating the accuracy of the results of measurement, all sources of error should be examined and the total possible error estimated. Errors of the constant or systematic type are particularly important, as they are not revealed by repetition of a measurement; some of them, moreover, are not revealed by error of closure.) See, also, Precision.

**Achromatic**—Free from false coloration.

—A term applied to lenses signifying their more or less complete correction for chromatic aberration.

**Acicular** — Needle-shaped; slender,

like a needle or bristle, as some leaves or crystals.

**Acid**—Any substance which yields hydrogen ions.

**Acidic**—A term applied to rock in which silicic acid (silica) or quartz predominates.

**Acid Process**—A method of making steel or homogeneous iron in a Bessemer converter or open-hearth furnace having an acid, as opposed to a basic lining.

—**Salt**—A salt in which the replaceable hydrogen of the corresponding acid is only partly exchanged for metallic atoms or basic radicals.

—**Slag**—The word "acid" is applied in a mineralogical sense to imply a preponderance of alumina and silica over the other constituents.

—**Soil**—A soil that is deficient in available bases, particularly calcium, and which gives an acid reaction when tested by standard methods. There is no full agreement on the most satisfactory test for acidity and field tests are made by the use of various convenient indicators. The intensity or degree of acidity can be expressed by the qualifying words: strongly, moderately, etc.

—Sometimes called a "sour" soil.

—**Steel**—Steel made without the use of lime.

—**Treated Finish**—Having surface formed by dissolving cement with acid together with scrubbing to expose the aggregate.

**Acidometer**—In electricity, an instrument for determining the specific gravity of an acid. Synonymous with hydrometer.

**Acidulous Water**—Mineral water charged naturally with carbon dioxide. Also applied to water containing sulphur compounds, especially sulphates.

**Acmite**—A brown or green silicate of sodium and iron belonging to the pyroxene group.

- Acoustic Absorptivity**—In architectural acoustics, the acoustic absorptivity of a surface is equal to one minus the reflectivity of that surface.
- Compliance**—The acoustic compliance of a sound medium is the reciprocal of the acoustic stiffness of the medium.
- Inertance**—In architectural acoustics (of a sound medium), that coefficient which, when multiplied by  $2\pi$  times the frequency gives the imaginary part of the acoustic impedance which results from the inertia or effective mass of the medium. The unit is the gram.
- Ohm**—An acoustic resistance, reactance or impedance is said to have a magnitude of one acoustic ohm when a sound pressure of one dyne per square centimeter produces a volume velocity of one cubic centimeter per second.
- Reactance**—In architectural acoustics (of a sound medium), the imaginary component of the acoustic impedance. It is the component of the acoustic impedance which may result from the effective mass or from the compliance of the medium. The unit is the acoustic ohm.
- Reflectivity**—In architectural acoustics (of a surface not a generator), the ratio of the rate of flow of sound energy reflected from the surface, on the side of incidence, to the incident rate of flow. Unless otherwise specified, all possible directions of incident flow are assumed to be equally probable. Also, unless otherwise stated, the values given apply to a portion of an infinite surface, thus eliminating edge effects.
- Resistance**—In architectural acoustics (of a sound medium), the real component of the acoustic impedance. This is the component of the acoustic impedance that is responsible for the dissipation of energy. The unit is the acoustic ohm.
- System**—A system adapted for the transmission of sound.
- Acre**—A measure of superficial area, usually of land. The statute acre of the United States and England contains 43,560 square feet, or 4,840 square yards. The so-called Scotch acre contains about 6,150 square yards and the Irish acre 7,840.
- Acreage Rent**—In mining, royalty or rent paid by the lessee for working and disposing of minerals at the rate of so much per acre.
- Acre-foot**—The amount of water required to cover 1 acre to a depth of 1 foot; equal to 43,560 cubic feet. Also used in estimating coal in place; thus a horizontal bed of coal 5 feet thick covering an area of 1 acre would contain 5 acre-feet of coal.
- Acrobatics**—Evolutions voluntarily performed with an aircraft other than those required for normal flight.
- Acropolis**—The upper hill or fortified part of a Greek citadel, the most noted being that at Athens.\*
- Actinograph**—An apparatus for measuring and recording the intensity of the chemical effects of light.
- Actinolite**—A light green calcium-magnesium-iron amphibole, having the formula as follows:  $3\text{Mg}(\text{Fe})\text{O} \cdot \text{CaO} \cdot 4\text{SiO}_2$ .
- Action, Balanced or Reversible**—(See balanced or reversible action.)
- Activated Sludge**—Sludge settled out of sewage previously agitated in the presence of abundant atmospheric oxygen.
- Process**—The agitation of a mixture of sewage with about 15 per cent or more of its volume of bacterially active liquid sludge in the presence of ample atmospheric oxygen for a sufficient period of time to at least coagulate a large proportion of the colloidal substances, followed by sedimenta-

tion adequate for the subsidence of the sludge floculi; the activated sludge having been previously produced by aeration of successive portions of sewage and maintained in its active condition by adequate aeration by itself or in contact with sewage.

**Active Conductor**—In electricity, one carrying an electric current.

—**Mass**—In chemistry, the number of gram molecular weights per liter in solution, or in gaseous form.

—**Plate**—In electricity, in a primary cell the negative plate, it being the one which is acted upon by the electrolyte of the cell.

—**Polar Surface**—Those parts of the magnet surface where the lines of force leave and enter in the greatest quantity.

**Acute Angle**—Any angle whose value is less than a right angle; i. e., less than 90 degrees.

—**Bisectrix**—The line which bisects the acute angle of the optic axes of biaxial minerals.

**Acyclic**—Opposed to cyclic; not moving in a cycle.

**Adamant**—A stone imagined by some to be of impenetrable hardness; a name given to the diamond and other substances of extreme hardness.

**Adamantine Drill** (shot drill)—A core drill employed in rotary drilling in very hard ground. A steel cylinder bit with a diagonal slot cut in the lower edge is attached to a core barrel and a small quantity of chilled steel shot fed in with the water at intervals. These find their way beneath the bit and wear away the rock as the bit rotates. A core from 4 to 30 inches in diameter is obtained.

**Adamellite**—A rock consisting chiefly of quartz, hornblende, mica and diorite with granite affinities.

**Adarce**—A calcareous sediment of some mineral species.

**Additions**—In railway valuation, additional facilities, such as additional equipment, tracks, buildings, bridges and other structures, and additions to such facilities.

**Ader Wax**—Crude ozocerite in leafy masses.

**Adhesion**—The force which holds together two bodies placed in close contact with each other.

—**Electrical**—(See electrical adhesion.)

—**Magnetic**—(See magnetic adhesion.)

**Adhesive Slate**—A very absorbent slate that adheres to the tongue if touched by it.

**Adiabatic**—This term refers to calorimetry carried on under such conditions that no heat is lost to the surrounding environment.

—**Compression**—That case of compression where during compression the temperature of the gas can rise unchecked, namely, where there is no transfer of heat to or from the fluid being compressed.

**Adinole**—Dense, felsitic rocks, composed of fine quartz and albite crystals. Actinolite and other minerals are subordinate.

**Adjustable Eye-Bar**—An eye-bar that can be lengthened or shortened after erection by means of a sleeve-nut, turn-buckle, or clevis.

—**Member**—A member of a bridge, the length of which can be increased or diminished at will.

—**Propeller**—A propeller whose blades are sq attached to the hub that the pitch may be changed while the propeller is at rest.

—**Rheostat**—In electricity, a resistance, any part of which may be cut in or out of the circuit.

**Admixture**—In the case of concrete, a material other than cement, water and aggregates, mixed or to be mixed into concrete, or to any of the ingredients thereof. Something added which is not generally part of the compound or element.

- Adit**—A nearly horizontal passage from the surface by which a mine is entered and unwatered. In the United States an adit is usually called a tunnel, though the latter, strictly speaking, passes entirely through a hill and is open at both ends. Frequently also called Drift, or Adit level.
- Adobe**—An impure calcareous clay, widely used in western United States for making semi-dried bricks.
- Structure**—This term describes a soil which on drying cracks and breaks into irregular but roughly cubical blocks. The cracks are usually wide and deep and the blocks are from 20 to 50 or more centimeters across. (Adobe soils are usually heavy textured and high in content of colloidal clay.)
- Adsorb**—To condense and hold a gas on the surface of a solid, particularly metals. Also to hold a mineral particle within a liquid interface.
- Adsorption**—In air conditioning, designates the property of certain substances to condense water vapor without themselves being changed either physically or chemically. Silica-gel, activated alumina and some other materials will take up and condense considerable quantities of water vapor from surrounding air at normal temperature and will then release it again by evaporation when heated.
- Workings**—Mine workings that are being advanced into the solid, and from which no pillars are being removed.
- Advanced Gallery**—A small heading driven in advance of the main tunnel in tunnel excavation.
- Advance Growth**—A term used in forestry and soil conservation service for young trees which have sprung up spontaneously in forest openings or under forest cover; volunteer growth.
- Adz**—A carpenter's chipping tool.
- Adzed Tie**—Rail sleeper prepared with smooth surface at the rail bearing points by the use of an adz (cutting tool).
- Adzing Machine**—Portable power-operated machine designed to adze the rail seat on railway ties to provide proper bearing for rail or tie plates.
- Aegirite**—The name of a soda pyroxene often prefixed to normal rock-names because of its presence, such as aegirite-granite, aegirite trachyte, etc.
- Aeolian**—An adjective applied to rocks formed of wind-borne sands. Some such aeolian sands yield large quantities of oil; practically all the big Baku spouters have been obtained from sands of this class.
- Aerate**—To expose to the action of the air; supply or charge with air.
- Aeration**—A process of bringing water into intimate contact with air for the oxidation of iron or organic matter, and for washing out gases and odors.
- The process of relieving the effects of cavitation by admitting air to the section affected, such as into the space between the face of a weir and the overfalling sheet of water.
- Aerial Circuit**—An electrical circuit erected overhead.
- Line**—In electricity, a tower or pole line.
- Aerial Railroad**—A system of cables from which to suspend cars or buckets, as in transporting or hoisting ore.
- Aerodynamic Balanced Surface**—A control surface that extends on both sides of the axis of the hinge or pivot or that has auxiliary devices or extensions connected with it in such a manner as to effect a small or zero resultant moment of the air forces about the hinge axis.
- Center, Wing Section**—A point located on or near the chord of the

mean line approximately one-quarter of the chord length aft of the leading edge and about which the moment coefficient is practically constant.

—**Volume** (or air volume)—The total volume of an aerostat, including its projecting parts.

**Aerodynamics**—The branch of dynamics that treats of the motion of air and other gaseous fluids and of the forces acting on solids in motion relative to such fluids.

**Aerodyne**—A generic term for aircraft that derive their lift in flight chiefly from aerodynamic forces.

**Aeroferric Magnetic Circuit**—In electricity, a magnetic circuit which is composed in parts of iron and air.

**Aero-Filter** (in sewerage)—Trickling filter in which the effluent is recirculated one or more times.

**Aerogram**—A message transmitted by wireless telegraphy.

**Aerograph**—Same as meteorograph.

**Aerolite**—A synonym for meteorite.

**Aerometers**—The air pistons of a Struve ventilator.

**Aeronaut**—The pilot of an aerostat.

**Aeronautics**—The science and art of flight.

**Aerophore**—The name given to an apparatus that will enable a man to enter places in mines filled with explosive or other deadly gases, with safety.

**Aerosiderite**—A meteorite consisting chiefly of iron, generally nickeliforous, with particles of phosphide of iron, carbon, and hydrocarbons.

**Aerostat**—(a) A generic term for an aircraft whose support is chiefly due to buoyancy derived from aerostatic forces. The immersed body consists of one or more containers filled with a gas that is lighter than air. (b) A balloon or airship.

**Aerostatic Lift**—The difference between the weight of a volume of air and of an equal volume of a

gas lighter than air under given conditions.

**Aerostatics**—The science that treats of the equilibrium of gaseous fluids and of bodies immersed in them.

**Aerostation**—The art of operating aerostats.

**Aetite**—A nodule consisting of a hard shell of hydrated oxide of iron, within which the yellow oxide becomes progressively softer toward the center, which is sometimes quite empty.

**Affluent**—A stream that flows into another; a tributary.

**After-bay**—The tailrace of a water power plant; a pond or reservoir at the outlet of the turbines.

**After-cooler**—A cooling device for reducing the heat of compression in the final stage of air compression and for the extraction of moisture.

**Afterdamp** (aftergases)—The mixture of gases which remain in a mine after a mine fire or an explosion of fire damp. It consists of carbonic acid gas, water vapor, nitrogen, oxygen, carbon monoxide, and in some cases free hydrogen, but usually consists principally of carbonic acid gas and nitrogen, and is therefore irrespirable.

**Agate**—A variegated waxy quartz in which the colors are in bands, in clouds, or in distinct groups; also a precious stone or gem made from this material.

—**Opal**—Opalized agate.

**Agent, Catalytic**—(See catalytic agent.)

**Agglomerate**—In geology, a chaotic assemblage of coarse angular pyroclastic materials.

**Aggradation**—The building up of any portion of the earth's surface toward a uniformity of grade or slope by the addition of material; especially the deposition of sediment in the beds of streams, and on the floors of bodies of standing water.

- Aggregate**—The mineral material, such as sand, gravel, shells, slag, or broken stone, or combinations thereof, with which the cement, or the bituminous material is mixed to form a mortar or concrete. **Fine aggregate** may be considered as the mineral inert material which will pass a one-fourth inch screen, and **coarse aggregate** the material which will not pass a one-fourth inch screen.
- Coarse**—(See coarse and fine aggregates.)
- Dense and Open Graded**—(See dense and open graded aggregates.)
- Fine**—(See coarse and fine aggregates.)
- Graded**—(See graded aggregates.)
- Agitating**—In the ready-mixed concrete industry, the process of slowly mixing to prevent segregation, in a truck mixer or a truck agitator while in transit to destination, concrete which has already been suitably mixed in a mixer.
- Agitation Ratio**—The ratio between the maximum diameter of a gangue particle and the diameter of the mineral particle that travels with it on a vanner.
- Agitator**—In mining, a mechanical stirrer used in pan amalgamation.
- Agonic Line**—A line passing through points on the earth's surface at which the direction of the magnetic needle is truly north and south; a line of no magnetic declination.
- Agricultural Liming Material**—Such a material shall be one whose calcium and magnesium content is capable of neutralizing soil acidity.
- Slag**—Usually granulated slag in sizes from  $\frac{1}{4}$ -in. to dust, which is mixed with soil for the purpose of aeration and neutralizing naturally occurring acids.
- Agrolith**—A patented paving material consisting of double coating the aggregate first with a hard bitumen, then, after cooling, with a softer bitumen. The prepared material is a hot-mix cold-lay type, especially for sheet asphalt gradings. Compaction is obtained by a roller rather than by traffic.
- Agrology**—That branch of agricultural science which treats of the origin, structure, analysis, classification, etc., of soils, especially in relation to crop production.
- Aileron**—A hinged or movable portion of an airplane wing, the primary function of which is to impress a rolling motion on the airplane. It is usually part of the trailing edge of a wing.
- Angle**—The angular displacement of an aileron from its neutral position. It is positive when the trailing edge of the aileron is below the neutral position.
- Linkage Arrangements:** Differential Aileron Linkage Arrangement—Ailerons so interconnected that a given movement of the control stick results in the upward displacement of one aileron being greater than the downward displacement of the other.  
Floating Aileron Linkage Arrangement—Ailerons so linked together and to the control stick as to "float" freely in the air stream except when displaced by the lateral motion of the control stick.
- Air**—The mixture of gases that surrounds the earth and forms its atmosphere; composed by volume of 21 parts of oxygen and 78 of nitrogen; by weight of about 23 parts of oxygen and 77 of nitrogen. It contains also about 0.03 per cent of carbon dioxide, some aqueous vapor, and about 1 per cent argon.
- Adit**—An adit driven for the purpose of ventilating a mine.
- Base**—(aerial photographic mapping) The distance between the exposure stations of two overlapping aerial photographs. See, also, Base Line.

- Bound**—A hydraulic term referring to the condition of a pipe-line wherein air entrapped in a summit prevents the free flow of water through it.
- Box**—Wooden tubes used to convey air for ventilating headings or sinkings or other local ventilation.
- Break Switch**—In electricity, that switch breaking an electric current in air, in contradistinction to that in another medium.
- Brick**—A hollow or pierced brick built into a wall to allow the passage of air.
- Chamber**—A closed chamber used on the discharge or suction end of a pump for the purpose of promoting a uniform flow of water and to equalize stresses upon the pump.
- Crossing**—In mining, a bridge that carries one air-course over another.
- Cushion**—A spring caused by confined air.
- Door**—A door for the regulation of currents of air through the workings of a mine.
- Drain**—A passage for the escape of gases from a mould while the molten metal is being poured in.
- Dry**—Degree of moisture content existing in a wet material exposed to air such that no further moisture is given up. Most air-dry substances contain moisture that can be expelled by heating them or placing them in a vacuum.
- Duct**—(aeronautic) A tube, usually of fabric, supplying air for filling or for maintaining pressure in the air-filled parts of an aerostat.
- Gas**—A combustible gas made by saturating air with the vapor of some volatile hydrocarbon mixture, as gasoline, and used for lighting and heating.
- Governor**—(See governor, air.)
- Hole**—In mining, a hole drilled in advance to improve ventilation by communication with other workings or the surface.
- Hose**—Laminated rubber and canvas tubing for conveying air under pressure. It is used in operating air tampers and other pneumatic tools and for spray-painting, cement-gun work, etc.
- Jig**—An apparatus for separating ores without water, by intermittent puffs of air.
- Level**—In mining, a level or airway of former workings made use of in subsequent deeper mining operations for ventilating purposes.
- Lift**—An installation for introducing air into the column of water in a well, thereby causing the water to rise.
- (sewage)—A device for raising sewage or other liquid by injecting air in and near the bottom of an open discharge pipe submerged in a well of the liquid to be raised.
- Line**—(aeronautic) An established system of aerial transportation, its equipment, or the company owning or operating it.
- Lock**—A passage, closed at both ends by doors, between airways along which currents of different pressures are flowing. Persons desirous of passing from one airway to the other can do so without personal inconvenience or interference with the system of ventilation.
- Oven**—A heated chamber for drying samples of ore, etc.
- Relief Valve**—(See valve, air relief.)
- Preliminary**—In wood preservation, refers to the air forced into wood before, and held during, the injection of preservative.
- Right**—A right to build in, occupy and otherwise use that portion of real property above a stated elevation, in conjunction with definitely located spaces on the ground surface, for foundation and supporting columns; an air lease.
- Scoop**—A scoop or hood designed to catch the air and maintain the

air pressure in ballonets, internal-combustion engines, ventilators, etc.

- Separators**—Equipment for the separation of material, after grinding, by air. As the material is ground to approximately the required fineness it is sucked up between the inner and outer cones. Then it enters the vanes which impart a whirling motion, throwing the heavier, coarser particles to the outer edge from which they drop back into the mill for further grinding. Fine material is drawn up through the separator outlet and passes out of the system as finished product. Fineness is regulated by the setting of the vanes. Setting them far over gives the most whirl and greatest fineness. Pointing them almost directly toward the center gives little whirl and coarser product.
- Shaft**—A shaft used for ventilating mines; it may either receive or discharge the circulating current.
- Shrinkage**—The decrease in volume which a clay undergoes in drying.
- Silt**—A short head between other air heads.
- Sollar**—A brattice carried beneath the tram rails or road bed in a heading or gangway.
- Speed**—The speed of an aircraft relative to the air.
- Stack**—A stack or chimney built over a shaft for ventilation.
- Stand**—An air vent on a pipe line.
- Tube**—The cylinder on a blowing engine that pumps the blast of wind or air.
- Valve**—A hydraulic term referring to a device that releases air from a pipe-line automatically without permitting loss of water. It may also admit air to the pipe automatically if the internal pressure becomes less than the atmospheric pressure.

—**Volume**—(See aerodynamic volume.)

—**Aircraft**—Any weight-carrying device designed to be supported by the air, either by buoyancy or by dynamic action.

—**Carrier**—A ship designed to carry aircraft and to permit their landing and take-off.

—**Air-binding**—A term used in soil conservation service to refer to the diminution of the rate of infiltration of water into soil as a result of the increase in the pressure of air trapped in the interstices of the soil.

—**Air-cooled Compressor**—A machine having radiating fins cast on the cylinder walls and in which the cooling of the compressor cylinder is obtained through the circulating atmospheric air around the compressor cylinder.

—**Slag**—Blast furnace slag which has been cooled in open pits or banks, resulting in a solid mass of tough, durable material.

—**Air-dried**—In wood preservation, refers to seasoned by exposure to the atmosphere until there is no further appreciable loss in weight due to evaporation of moisture.

—**Air-End Way**—Ventilation levels run parallel with main level.

—**Air-slaked**—Slaked by exposure to the air; as air-slaked lime.

—**Lime**—A product composed of variant proportions of the oxide, hydroxide, and carbonate of calcium, or calcium and magnesium and derived from exposure of quicklime.

—**Airfoil**—Any surface, such as an air-plane wing, aileron, or rudder, designed to obtain reaction from the air through which it moves.

—**Profile**—The outline of an airfoil section.

—**Section**—A cross section of an airfoil parallel to the plane of symmetry or to a specified reference plane.

- Airline**—The great circle route between two points.
- Airometer**—An instrument for measuring the rate of flow of air; an air meter.
- Airplane**—A mechanically driven fixed-wing aircraft, heavier than air, which is supported by the dynamic reaction of the air against its wings.
- Dope**—The liquid material applied to the fabric surfaces of airplanes to increase their strength, to produce tautness by shrinking, and to act as a filler for maintaining airtightness.
- Airport**—A tract of land or water which is adapted for the landing and take-off of aircraft and which provides facilities for their shelter, supply, and repair; a place used regularly for receiving or discharging passengers or cargo by air.
- Beacon**—A beacon light of high candlepower located at or near an airport for the purpose of indicating the general or specific location of the airport.
- Airship**—An aerostat provided with a propelling system and with means of controlling the direction of motion.
- Hull**—The main structure of a rigid airship, consisting of a covered elongated framework which incloses the gas cells and supports the cars and other equipment.
- Shed**—(See dock.)
- Station**—(1) The complete assembly of sheds, masts, gas plants, shops, landing fields, and other equipment required to operate airships and supply their needs. (2) The base from which airships are operated.
- Air-Speed Head**—An instrument which, in combination with a gage, is used to measure the speed of an aircraft relative to the air. It usually consists of a pitot-static tube or a pitot-venturi tube.
- Airway**—In mining, any passage through which air is carried.
- (aeronautic)** An air route along which aids to air navigation, such as landing fields, beacon lights, radio direction-finding facilities, intermediate fields, etc., are maintained.
- Beacon**—A beacon light of high candlepower, other than an airport or landmark beacon, located on or near an airway for the purpose of indicating the location of the airway.
- Airworthiness**—The quality of an aircraft denoting its fitness and safety for operation in the air under normal flying conditions.
- Airy's Spiral**—A four-rayed spiral curve, named after the discoverer and shown when sections of right-handed and left-handed crystals are placed together in a polariscope.
- Aitch Piece**—Parts of a pump in which the valves are fixed.
- Akerite**—A rock variety of syenite consisting essentially of orthoclase, plagioclase, biotite, augite and quartz.
- Akin's Classifier**—A classifier consisting of an interrupted-flight screw conveyor operating in an inclined trough.
- Alabandite**—A manganese sulphide having the formula  $MnS$ . Contains about 37 per cent sulphur and 63 per cent manganese.
- Alabaster**—Compact fine-grained gypsum, white or delicately shaded.
- Alaskite**—Any igneous rock consisting essentially of quartz and alkalic feldspar, without regard to texture.
- Alberti Furnace**—A continuous reverberatory furnace.
- Albertite**—A jet-black, pitchlike, brittle hydrocarbon with conchoidal fracture, differing from ordinary asphalt in being only partly (about 30 per cent) soluble in turpentine, and in very imperfect fusion when heated.
- Albite**—An end member of the plagioclase series of feldspars, contain-

ing no calcium and consisting of sodium-aluminum silicate; sodium feldspar. Less common than the intermediate member, which may be considered as mixtures of albite with the other end member, anorthite.

**Albite**—Granitoid rocks, consisting chiefly of albite.

**Albitization**—The production in a rock of albite as a secondary mineral.

**Albo-Carbon**—A solid residuum of creosote.

**Albrecht Condenser**—A condenser used in petroleum distillation, to separate the distillate into its various fractions.

**Albronz**—A durable alloy of copper and aluminum, used for telescope bearings, etc.

**Alcove**—A large, deep niche formed by a stream of water in a precipitous face of approximately horizontal strata.

**Alembic**—An apparatus formerly much used in distilling. Usually made of glass or metal.

**Alfenid**—A nickel alloy electroplated with silver.

**Alidade**—An auxiliary circle, frame, or movable arm, carrying microscopes or verniers for reading the divisions of a graduated circle or arc; also a theodolite having such an arm.

**Alignment**—(See alinement.) The course along which the center line of a roadway, railway, or channel is located.

**Alinement**—The horizontal location of an engineering structure with reference to curves and tangents.

—(**Or Alinement**)—Formation or position in line, or, more properly, in a common vertical plane.

—(railway or highway surveying) The ground plan, showing the alinement or direction of the route to be followed, as distinguished from a profile, which shows the vertical element.

**Alite**—A term given by Tornebohm in 1897 to the principal constituent of portland cement, later identified as  $C_3S$ .

**Alive**—In electricity, a term referring to the circuit carrying an electric current.

**Alkali**—In chemistry, any substance having marked basic properties. In its restricted and common sense the term is applied only to hydroxides of potassium, sodium, lithium, and ammonium. They are soluble in water, have the power of neutralizing acids and forming salts with them, the property of corroding organic substances, and of turning red litmus blue.

—**Flat**—A sterile plain, containing an excess of alkali, at the bottom of an undrained basin in an arid region.

—(loose reference)—Soluble salts in the soil. In excessive quantities they become injurious to plants. (See alkali metal, and alkaline earths.)

—**Metal**—Any metal of the alkali group, as lithium, sodium, potassium, rubidium, or caesium.

—**Soils**—In soil conservation, soils that contain harmful concentrations of mineral salts. In general, black alkali consists of sodium carbonate. Water containing it will dissolve humus, leaving a black residue which is very detrimental to plants. For the most part, white alkali consists of sodium sulfate.

—**Waste**—Waste material from the manufacture of alkali; as soda waste in the Leblanc process.

—**Water**—A term commonly used to designate water containing in solution any compound of sodium or potassium in appreciable amounts.

**Alkalimeter**—An instrument to ascertain the strength of alkalis, or the quantity of an alkali in a mixture.

**Alkaline Earths**—The oxides of barium, calcium, and strontium. Some

include also magnesium oxide. All are in their properties intermediate between the true alkalis and the earths proper.

—**Metals**—Those metals whose oxides combine with water to form alkalis, as lithium, sodium, and potassium, etc.

**Allen-O'Hare Furnace**—A horizontal double-hearth furnace for calcining sulphide ores.

**Allerdyce Process**—In wood preservation, refers to a two-movement treating process involving the injection of a solution of zinc chloride followed by creosote.

**Alley**—A narrow supplementary thoroughfare for the public use of vehicles and pedestrians affording access to abutting property.

**Alliaceous**—Applied to minerals having the odor of garlic; for example, arsenical minerals.

**Alligator Riveter**—A jaw riveter worked by the action of a cam, used in shopwork.

—**Wrench**—A wrench with fixed spreading jaws, having an inside roughened surface, suggestive of the open mouth of an alligator.

**All-mine Pig**—Iron smelted entirely from raw ore.

**Allogenic**—A word meaning originating elsewhere; whether applied to the components of a clastic rock or to xenoliths.

**Allotriomorphic**—A term used to describe those minerals in an igneous rock which do not possess their own crystal faces or boundaries. They usually result when a number of minerals crystallize at once so as to interfere with one another's growth.

**Alloy**—A substance consisting of two or more metals mixed together, or non-metallic bodies mixed with metals, in intimate solution or combination with one another, forming, when melted, a homogeneous fluid. When composed of two, three, or four metals or elements,

it is called respectively Binary alloy, Ternary alloy and Quaternary alloy.

—**Cast Iron**—Cast iron alloyed with some other metal.

—**Steel**—Steel that contains one or more elements other than carbon in sufficient proportion to modify or improve substantially and positively some of its useful properties. For example, manganese steel.

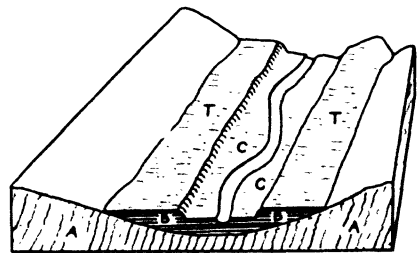
**Alloyage**—The act or process of alloying; specifically, in minting, of alloying the precious metals with baser ones to harden them.

**All-Pass Transducer**—In acoustics, a structure whose attenuation constant is zero for all frequencies from zero to infinity.

**All-Sliming**—Crushing all the ore in a mill so fine a state of subdivision that only a small percentage will fail to pass a 200-mesh sieve.

**Alluvial Fan**—The outspread sloping deposit of boulders, gravel, and sand left by a stream where it spreads from a gorge upon a plain or open valley bottom.

—**Gold**—Gold found in association with water-worn material.



*Block diagram illustrating the formation of river terraces. AA, section of river-cut valley; BB, alluvial deposits of river; CC, new flood plain of river; TT, former flood plain, now forming terraces. (After Pirsson.)*

—**Tin**—Stream tin, or disintegrated cassiterite found in the gravel

along the courses of valleys and rivers on the bedrock. Generally the purest tin ore.

**Alluviation**—The process of accumulation of deposits of gravel, sand, silt, or clay, at places where the flow is choked in the currents of rivers, lakes, or estuaries. Such deposits occur chiefly as flood plains, bars, deltas, etc.

**Alluvium**—Deposits of mud and silt commonly found on the flat lands along the lower courses of streams.

**Almandite**—An iron-aluminum garnet. Used as a gem. Also called Almond stone.

**Almond Furnace**—A furnace in which the slags of litharge left in refining silver are reduced to lead by being heated with charcoal.

**Alnoite**—A very rare rock with the composition of a melillite basalt. It was first discovered in dikes on the island of Alno, off the coast of eastern Sweden.

**Aloes Rope**—A special kind of rope, sometimes used in oil-well drilling, the breaking strain of which is 300 kg. per circular centimeter.

**Alpha Brass**—A copper-zinc alloy with a copper content greater than approximately 64 per cent.

**Dicalcium Silicate**—In cement technology, a modification of dicalcium silicate probably stable only at high temperature; commonly abbreviated  $a-2\text{CaO} \cdot \text{SiO}_2$  or  $a-\text{C}_2\text{S}$ .

**Alpine Zone**—The vegetational belt above the timber line.

**Altapave**—A patented process consisting of passing raw sands of the Alberta Tar sand deposits through process which eliminates the light oils, bringing materials up to a standard and fixed percentage of asphalt. Material is then compressed into brick or slab form, and powdered with sandstone dust.

**Alt-Azimuth**—An instrument for simultaneously observing the azimuth and altitude of a celestial body.

**Alternating Return Trap or Alter-**

**nating Return Trap and Receiver**—(heating terminology) Returns water to a boiler and alternately permits the condensate to flow into the receiver and from the receiver to the boiler, and prevents water from backing from the boiler into the receiver and from the returns being backed out of the receiver into the return system.

**Alternator**—In electricity, a common term for an alternate current dynamo.

**Altigraph**—A recording altimeter.

—(aeronautic)—An instrument that measures the elevation of an aircraft above a given datum plane.

**Altimeter**—An aneroid barometer graduated to show height instead of pressure.

**Altimeter-Calibration Standard Atmosphere**—A standard atmosphere used in calibrating aeronautic instruments. The standard now in use in the United States is completely defined in N.A.C.A. Report No. 246.

**Altitude**—Vertical distance or elevation above any given point or base level, as the sea; height; hence, also such distance numerically expressed.

**Mixture Control**—(See mixture control, altitude.)

**Aludel**—One of a series of pear-shaped vessels of glass or earthenware fitted one into another and used for condensation, as in subliming mercury.

**Alum Flower**—Powdered burnt alum.

**Glass**—Crystallized alum.

**Salts**—Natural salts from which alum can be made.

**Alumina**—Oxide of aluminum,  $\text{Al}_2\text{O}_3$ . Pure crystalline alumina is represented by corundum, sapphire, and ruby. The commonest form of alumina is as a silicate, of which clays are mostly composed, and as the compound silicates of aluminum and other metals, of which a large class of minerals is formed.

- Aluminous**—Of the nature of alumina or clay.
- Aluminum**—A white metal with high tensile strength and low specific gravity. Used for purifying steel, for light weight truck bodies, for airplane structure, for fast railway rolling stock, etc.
- Minerals**—Alunite, amblygonite, andalusite, bauxite, corundum, cryolite, cyanite, disapore, sillimanite, spinel, topaz, turquoise, wavelite, and many silicates.
- Silver**—A bright alloy of aluminum and silver, used in instruments where lightness is an object, the lightness increasing with the proportion of aluminum.
- Solder**—An alloy of gold, silver, and copper, with sometimes a little zinc.
- Alum-shale**—In petrology, a shale impregnated with alum, the latter constituent being due to the action on sericite of sulphuric acid produced by the oxidation and hydration of pyrite.
- Alundum**—An artificial abrasive used in the manufacture of oilstones and grinding wheels. Made by fusing the natural mineral bauxite in electric furnaces. Alundum has the same chemical composition as the natural mineral corundum.
- Amalgam**—Commonly considered a combination or mixture of a metal with mercury.
- Amazon Stone** (amazonite) — A green microcline feldspar. A variety of orthoclase. Used as a gem.
- Amber**—A hard, brittle, translucent, fossilized vegetal resin, of a clear yellowish-brown or light yellow color. Called in mineralogy Succinite.
- Ambroid**—A reconstructed amber, made by heating and uniting by pressure fragments of amber.
- American Pump**—A special kind of bailer, used in oil fields for cleaning out wells.
- Amethyst**—A purple or bluish-violet quartz,  $\text{SiO}_2$ . Used as a gem.
- Amianthus**—(See asbestos.)
- Amiesite**—A paving material of broken rock, placed in a mixer and intermingled. The specified quantity of a liquifier which may be any mineral oil, such as kerosene, gasoline, crude naphtha, or volatile petroleum distillate, is then sprayed into the mixer, coating the surfaces of the rock. Amiesite asphalt cement at a temperature of between 250 and 300 deg. F. is then poured into the mixer so as to coat all of the stone. The mixing continues until the mass presents a uniform black color. Hydrated lime is then added to the mix and mixing continues until the uniform black color again appears. The mineral filler is finally added in such a way that the particles are uniformly spread throughout the mass.
- Ammonal**—An explosive consisting of a mixture of powdered aluminum (1 part) and nitrate of ammonium (8 parts).
- Ammonia**—A colorless gaseous compound of hydrogen and nitrogen ( $\text{NH}_3$ ) with extremely pungent smell and taste. Sp. Gr. as compared with air, 0.589.
- Gelatin**—An explosive consisting of blasting gelatin, ammonium nitrate, and charcoal.
- Nitrate Powder**—An explosive composed of 80 per cent ammonium nitrate, 5 per cent potassium chlorate, 10 per cent nitroglucose and 5 per cent coal tar.
- Ammonite**—Ammonium nitrate explosives, containing from 70 to 95 per cent ammonium nitrate, besides combustible components, which are so-called carbon carriers, as resin, meal, naphthalene.
- Amorphous**—Without definite form; applied to rocks and minerals having no definite crystalline structure.
- Amortization**—The repayment of a debt, principal and interest, in

- equal annual installments. Frequently used in finance as the extinction of a debt, regardless of the means employed.
- The process of gradually recovering a cost or value of an asset or extinguishing a liability (appraisal term).
- Amount**—In engineering economics and cost keeping, the principal plus accumulated interest.
- Ampelite**—Shales mixed with pyrite and carbonaceous matter which may yield alum-shales.
- Amperage**—The strength of an electric current measured in amperes.
- Ampere**—The practical unit of electric current; the current produced by 1 volt acting through a resistance of 1 ohm.
- Foot**—One ampere flowing through 1 foot of an electric conductor. A wire 20 feet long conducting a current of 6 amperes is said to have 120 ampere feet.
- Hecto**—(See hecto ampere.)
- Hour**—The common unit for measuring current consumption, being the amount of electricity transferred by a current of one ampere in one hour.
- Hour Capacity**—The number of ampere-hours which can be delivered by a cell or battery under specified conditions as to temperature, rate of discharge and final voltage.
- Amphibian**—An airplane designed to rise from and alight on either land or water.
- Amphibolite**—A metamorphic rock consisting of hornblende, or some other member of the amphibole group. It is, as a rule, a synonym of hornblende schists, but is preferable to the latter, when the schistosity is not marked.
- Amphi-prostyle**—A temple having a portico at either end.\*
- Amplitude** (of a tide, or of a component)—The semi-range of that tide or component.
- The maximum value of the displacement in an oscillatory motion.
- Of Vibration**—The maximum movement or displacement of any particle that vibrates.
- Amulco**—This is a trade name of a bituminous emulsion. Like other emulsion manufacturers, the company produces various grades for the various uses in road work.
- Amvis**—An explosive mixture containing 90 per cent ammonium nitrate, 5 per cent wood meal, and 5 per cent chlorodinitrobenzene.
- Amygdaloid**—A vesicular or cellular igneous rock, ordinarily basaltic, in which the vesicles have been partly or wholly filled with a secondary deposit of calcite, quartz, epidote, native copper, or zeolites.
- Amygdule**—A small globular cavity in an eruptive rock caused by steam or vapor at the time of its eruption and generally lined afterwards with secondary minerals.
- Analcite**—A hydrous sodium aluminum silicate, belonging to the zeolite group.
- Analcite-basalt**—A variety of basalt whose feldspar may be replaced by analcite.
- Analysis**—A separation of substances, either by chemical or physical means, that a determination of the relative parts may be made; to resolve into elements.
- Analyzer**—That part of a polariscope that receives the light after polarization, and exhibits its properties.
- Anamorphic**—A term referring to the processes of metamorphism in which integrating, building-up, constructive alterations take place, involving the formation of complex minerals from those of simpler type. These anamorphic processes take place in the zone of cementation.
- Anatexis**—In petrology, an ultrametamorphic process in which deep-seated rocks are remelted by the emanation of heat and hot gases

from below, thus providing regenerated magmas in situ. A refusion of igneous rocks.

**Anchor Arm**—The end portion of a cantilever bridge extending from one of the main piers to an anchor pier.

—**Bolt**—A foundation bolt; a drift spike, or other device used for holding any mechanism or structure down. It may or may not be threaded.

—**Ice**—Ice that forms on the bed of a stream.

—**Light**—A light, or group of clear lights carried on an aircraft to indicate its position at night while at anchor.

—**Oven**—An oven from which coke is removed with an anchor-shaped rabble.

—**Pile**—Pile to which a timber abutment, wing wall, or other object is fastened by means of rods or cables, to secure against motion or overturning.

—**Post**—A post located between end or corner posts of a fence and used as an anchor for stretching wire.

**Anchorage**—That portion of a harbor in which ships are permitted to lie at anchor.

—A device for holding down any part subjected to uplift, such as the end of the anchor arm of a cantilever bridge.

—The object or objects to which a structure is anchored; i. e., to which it is fastened back for fixity.

**Anchor-Ice**—Ice forming on the bed of streams in cold, clear weather.

**Andalusite**—An aluminum silicate  $\text{Al}_2\text{SiO}_5$ , sometimes used as a semi-precious stone.

**Andalusite-hornstone**—A compact contact rock containing andalusite, produced from shales or slates by intrusions of granite.

**Andesine**—One of the plagioclase feldspars. Intermediate between albite and anorthite. A silicate of sodium calcium, and aluminum,

with the sodium in excess of the calcium. An important constituent of andesite and diorite.

**Andesite**—A volcanic rock, of fine-grained texture, consisting chiefly of plagioclase feldspar and ferromagnesian minerals, without olivine.

**Anemometer**—An instrument for measuring the velocity of air currents; specifically, in mines, a common form consists of a small delicately mounted disk fan connected by means of gears with indicating dials. Especially useful when air current is over 100 feet per minute.

**Aneroid Barometer**—An instrument for showing the pressure of the atmosphere by means of the movements of an elastic top of a metallic box from which that air has been partly exhausted. The most sensitive aneroids show the variation of pressure due to a difference of height of a few feet; hence the instrument is much used in measuring altitudes.

**Angle**—Is the amount of rotation (in a fixed plane) by which a straight line may be changed from one direction to any other direction. If the rotation is counter-clockwise, the angle is said to be positive; if clockwise, negative.

—A structural iron section.

—Difference in direction. **Angle to the Right**—Horizontal angle measured clockwise from the preceding line to the following one.

—**Of Attack**—The acute angle between a reference line in a body and the line of the relative wind direction projected on a plane containing the reference line and parallel to the plane of symmetry.

—**Beam**—A two-limbed beam used for turning angles in shafts, etc.

—**Block**—A block of cast iron or wood, having a triangular cross-section, against which the braces and counters of a Howe bridge truss abut.

- Brace**—A brace used to prevent mine timbers from riding or leaning. A brace across an interior angle.
- Bulb**—An angle-iron section in which one leg has a bulb along one edge.
- Clip**—A short attaching angle that takes a portion of the stress of any member; also termed a "lug-angle."
- Compressor**—A machine which is of the multi-cylinder type with part of the compressing element located horizontally and part of the compressing element located vertically.
- Connecting**—An angle-iron used for connecting two pieces.
- Deflection**—Horizontal angle measured from the forward prolongation of the preceding line, right or left, to the following line.
- Flange**—One of the upper or lower chord angles in a girder.
- Flashing**—An angle to which flashing is attached.
- Of Incidence**—The angle formed by the line of incidence and a line drawn from the point of contact perpendicular to the plane or surface on which the incident ray or body impinges.
- Interior**—Horizontal angle between adjacent sides of a polygon, measured within the polygon.
- Iron**—A rolled piece of steel having a cross-section shaped into a right angle.
- Lacing or Lattice**—An angle used in latticing.
- A system of lacing in which angle-irons are used in place of bars.
- Lug**—Same as "clip angle."
- Of Attack for Infinite Aspect Ratio**—The angle of attack at which an airfoil produces a given lift coefficient in a two-dimensional flow. Also called "effective angle of attack."
- Of Dead Rise**—The angle with the horizontal made by a transverse line joining the keel of a hull with the chine.
- Of Heel**—The angle between a horizontal plane and the lateral axis of a seaplane on the water.
- Same as angle of wing setting. In British terminology the angle of incidence is equivalent to the American term "angle of attack."
- Of Pitch** (aircraft)—The acute angle between two planes defined as follows: One plane includes the lateral axis of the aircraft and the direction of the relative wind; the other plane includes the lateral axis and the longitudinal axis. The angle is positive when the nose of the aircraft is above the direction of the relative wind. (In normal flight the angle of pitch is the angle between the longitudinal axis and the direction of the relative wind.)
- (propeller)—Same as angle, blade.
- Of Pull**—The angle between the vertical and an inclined plane bounding the area affected by the subsidence beyond the vertical. Applied to slides of earth.
- Of Repose**—The angle which the sloping face of a bank of loose earth, or gravel, or other material makes with the horizontal.
- Of Roll** (or angle of bank)—The angle through which an aircraft must be rotated about its longitudinal axis in order to bring its lateral axis into the horizontal plane. The angle is positive when the left side is higher than the right.
- Seat**—A short angle riveted to a column to support, temporarily, a beam during erection.
- Shelf**—Same as "seat angle."
- Of Stabilizer Setting**—The acute angle between the longitudinal axis of an airplane and the chord of the stabilizer. The angle is positive when the leading edge is higher than the trailing edge.
- Starred**—A pair of angles placed

- corner to corner with legs outstanding and held in position by tie-plates riveted thereto at intervals.
- Stiffening**—Angles riveted to the web of a girder to stiffen it against buckling.
- Thrust**—A short angle inserted between the outstanding legs of a column at the bottom of the cantilever bracket to carry the thrust from the latter to the cross-girder. An angle member in traction bracing.
- Vertical**—Angle of elevation or depression, measured from the true horizontal plane.
- Of Wing Setting**—The acute angle between the plane of the wing chord and the longitudinal axis of the airplane. The angle is positive when the leading edge is higher than the trailing edge.
- Of Yaw**—The acute angle between the direction of the relative wind and the plane of symmetry of an aircraft. The angle is positive when the aircraft turns to the right.
- Anglesite**—Lead sulphate,  $PbSO_4$ , containing 68 per cent lead.
- Angleur Furnace**—A furnace for the distillation of zinc.
- Angular Aperture**—Of an objective is the largest angular extent of wave surface which it can transmit.
- Angular Velocity**—Time rate of motion in a fixed rotational direction.
- Angus Smith Composition**—A protective coating for valves, fittings, and pipe used for underground work. It is composed of coal tar, tallow, resin, and quicklime, and must be applied hot.
- Anhedron**—A name for the individual mineral components of igneous rock, that lack crystal boundaries and that cannot therefore be properly called crystals.
- Anhydrite**—An oxide of a nonmetallic body, or an organic radical, capable of forming an acid by uniting with water, or of being formed from an acid by the abstraction of the water, or of uniting with basic oxides to form salts.
- Anhydrite**—Calcium sulphate,  $CaSO_4$ , or  $CaO.SO_3$ . Contains 41.2 per cent lime and 58.8 per cent sulphur trioxide. Usually associated with gypsum, to which it alters.
- Anhydrous**—Destitute of water, especially water of crystallization.
- Anisotropic**—Not having the same properties in all directions with regard to light; characteristic of all crystalline minerals except those of the isometric system.
- Ankerite**—A white, red, or grayish calcium-magnesium-iron carbonate.  $CaCO_3(Mg, Fe, Mn) CO_3$ .
- Anneal**—To heat, fire, bake, or fuse, as glass, earthenware, ore, etc.
- To treat by heating and gradually cooling, so as to toughen and remove brittleness.
- Annealing Color**—The hue taken by steel in annealing.
- Electric**—(See electric annealing.)
- Annual Ring**—In the case of wood, the growth layer put on in a single growth year.
- Annuity**—An annual allowance, payment, or income. The return from an investment of capital with interest in a series of yearly payments.
- Annular Borer**—A tool with a tubular bit for removing a cylindrical core as a sample. Used in prospecting.
- Kiln**—A kiln having compartments.
- Annulet**—In architecture, a small flat surfaced fillet, annular in plan. It may be found under the echinus of the Doric capital.\*
- Annunciator Wire**—In electricity, insulated copper wire of small diameter. Used in door bells, etc.
- Anode Copper**—Crude-copper plates, usually cast from the converter, used as anodes in the electrolytic process of refining copper.

**Anogene**—A name for rocks that have come up from beneath the earth's crust; same as eruptive rocks.

**Anomalistic Month**—The month of the moon's distance, approximately  $27\frac{1}{2}$  days in length.

**Anomalous Magnet**—A magnet with several poles.

**Anorthite**—An end-member of the plagioclase feldspar series, the one consisting of calcium-aluminum silicate and containing no sodium. The intermediate plagioclases may be regarded as mixtures of anorthite with the other end-member albite.

**Anorthosite**—Granitoid rocks that consist of labradorite. They are extensive in the Adirondacks.

**Anta**—In architecture, a pilaster terminating the side wall of a Greek temple.\*

**Antecedent Stream**—In geology, a stream which has retained its course across some uplift, as a fold, fault.

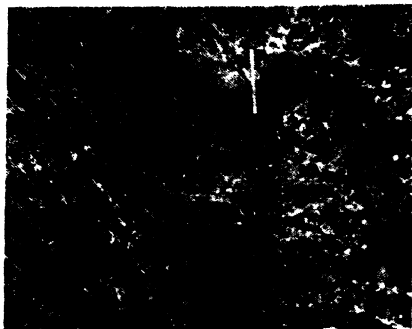
**Anthophyllite**—An orthorhombic amphibole,  $(Mg,Fe)SiO_3$ , also containing aluminum at times.

**Anthracene**—A crystalline salt derived from coal tar. Melting point 216.5 degrees C. Boiling point 360 degrees C.

—**Oil**—A distillate from coal tar, distilling between 270 degrees and 400 degrees C. Sometimes called "green oil."

**Anthracite (hard coal)**—A hard black lustrous coal containing 85 to 95 per cent carbon as against 70 to 85 per cent in bituminous or "soft" coal. Characterized by its small percentage of volatile matter, high specific gravity, hardness, nearly metallic luster, rich black color, and semi-conchoidal fracture. It ignites with difficulty and produces an intense hot fire.

**Anthraconite**—A coal-black bituminous marble or limestone usually emitting a fetid smell when rubbed.



*Anticline*

**Anticline**—A term applied to granite sheets or sedimentary beds that form an arch.

**Anticlinorium**—A series of anticlines and synclines, so grouped that taken together they have the general outline of an arch; opposed to synclinorium.

**Antidrag Wire**—A wire intended primarily to resist the forces acting forward in the chord direction. It is generally enclosed in the wing.

**Antiflutter Wire**—A wire in the plane of the outer cover for local reinforcement and for reducing flutter due to variations in air pressure or propeller wash.

**Antifriction Metal**—Any alloy having a low coefficient of friction; used for bearing surfaces.

**Anti-Magnetic**—In electricity, those items not subject to magnetic influence. Such as rubber, glass, etc.

**Antimony**—An element of metallic appearance and crystalline structure, tin-white in color, hard, and brittle. Occurs in free state and combined in various minerals. Symbol Sb.

**Antinodes**—In acoustics, the points, lines, or surfaces of a stationary wave system which have a maximum amplitude.

**Anti-Resonance**—In acoustics, anti-resonance is the condition existing at an anti-resonant frequency.

**Anvil**—A block, usually of iron, steel-faced and of characteristic shape, on which metal is shaped, as by hammering and forging.

**Antiseptic**—That which may be used to destroy bacteria with little or no harmful effect on the living body. Very common antiseptics are aqueous solutions of carbolic acid and of corrosive sublimate.

**Apatite**—A calcium phosphate containing a little fluorine or chlorine.

**Aperiodic**—Devoid of oscillatory motion.

**Aperture, Angular**—(See angular aperture.)

**Aperture, Numerical**—(See numerical aperture.)

**Apex**—The intersection of a web member with a chord or flange; also called a panel point.

**Aphanite**—An old name for dense, dark rocks, whose components are too small to be distinguished with the eye.

**Aphanitic**—Refers to rocks that are so fine grained that the individual minerals cannot be distinguished by the naked eye.

**Apelion**—The position of the earth farthest from the sun in its elliptical orbit around the sun.

**A. P. I. Gravity**—The A. P. I. gravity scale is an arbitrary one which is related to the specific gravity of a petroleum oil in accordance with the formula:

$$\text{Deg. A.P.I.} = \frac{141.5}{\text{sp.gr. } 60/60 \text{ deg. F.}} - 131.5$$

**Aplite**—A fine-grained granite, generally occurring in dikes and containing little mica and a high percentage of silica.

**Apochromat**—A term applied to photographic and microscopic objectives indicating the highest degree of color correction.

**Apogean Range**—The range of tide at the time of apogean tides.

—**Tides**—The decreased range tide occurring at the time the moon is in apogee.

**Apogee**—The position of the moon farthest from the earth in its elliptical orbit around the earth.

**Apophyge**—In architecture, the cavetto connecting the shaft of a column at the top and bottom to the fillets.\*

**Apophyses**—In petrology, veins, tongues, or dikes that can be directly traced to larger intrusions, from which they are offshoots.

**Apparent Watts**—In electricity, the volt-amperes in a reactive alternating current system.

**Appendix**—The tube, usually located at the bottom of a balloon, used primarily for inflation and deflation. In the case of a free balloon it may also serve as an automatic-discharge opening. The term should be restricted to the various types of balloons and should not be applied to airships.

**Applied Voltage**—In electricity, that pressure exerted on an electric current; the impressed current.

**Appolt Oven**—An oven for the manufacture of coke, differing from the Belgian in that it is divided into vertical compartments.

**Appraisal**—A process of valuation; in a more technical usage: a systematic, analytical determination and recording and analyzing of property facts, investments and values, based primarily on a personal inspection and inventory of the property.

—**Certificate**—A signed statement by an appraiser, setting forth in brief form the date of appraisal, the character and extent of the property, the extent of the investigation, the limiting conditions of the engagement, basis upon which the findings are made, and the conclusions of the appraiser.

—**Classifications**—The groups of a property inventory adopted by the appraiser, each containing items of like kind or service character.

—**Inventory**—A detailed listing of the

individual items comprising an assembled property, either with or without unit costs or prices applied thereto.

- Organization**—An organization of specialists cooperating, under coordinated executive supervision, with their respective talents and using joint facilities of records, costs and statistical data, and standards of practice.
- Report**—A written report setting forth the findings and conclusions of the appraiser, and the basis therefor.
- Report** (preliminary)—A statement containing general and tentative conclusions predicated upon incomplete and/or partially substantiated data; usually issued upon preliminary findings during the progress of an appraisal and with conclusions subject to readjustment in the final report.
- Service**—A term applying comprehensively to the act of investigating, inventorying, analyzing and reporting upon properties, rights, history, condition, costs, depreciation and other property facts, usually but not necessarily with conclusions of value.
- Summary**—A tabular statement setting forth the results of an appraisal; usually confined to appraised costs and/or values by basic divisions and classifications without property descriptions.
- Appraise**—(a) to value (b) process of property investigation and analysis (c) the formation of an opinion as to property facts, rights, or value.
- Appraiser**—(a) a valuer of goods or property (b) one who specializes in property investigation, inventories, analysis, and reports.
- Appraiser's Opinion**—(a) an expert judgment of value; (b) an opinion as to property rights, facts, investments or values, based on personal inspection and the recorded mathe-

matical and logical analysis of specialists.

**Appreciation**—An appraisal term representing the increase over a former cost or value, resulting from changed market conditions or demand for the specific property. It is an antonym of loss in value, but is not an antonym of depreciation used as an appraisal term.

**Approach**—The construction leading to the end of a bridge.

—**Light**—A light, usually green, designed to indicate a favorable direction of approach for landing an aircraft.

—**Slab**—A reinforced concrete slab spanning the backfill behind the abutment of a bridge.

**Apron**—That portion of a wharf or pier lying between the waterfront edge and the shed. Strictly speaking, from the viewpoint of construction, that portion of the wharf carried on piles beyond the solid fill.

—A hydraulic term referring to a floor or lining of concrete, timber, etc., to protect a surface from erosion, such as the pavement below chutes, spillways, or at the toe of a dam.

—A flared panel of fence set parallel with a railroad track and along outside edge of a stock guard.

—**Car Ferry**—A bridge structure supporting tracks connecting the car deck of a car ferry with the tracks extending to land, hinged at the shore end so that it is free to move vertically at the outboard end to accommodate varying elevations of ferry.

—**Ice**—(See ice apron.)

—**Track**—Railroad track along the waterfront edge of a wharf or pier for direct transfer of cargo between ship and car.

**Apteral**—In architecture, a temple without columns on the sides. Greek origin.\*

**Aqua Fortis**—Nitric acid. Applied especially to the weaker grade of the commercial acid.

—**Regia**—A mixture of nitric and hydrochloric acids. By the action of the chlorine evolved it dissolves gold or platinum.

**Aquamarine**—A transparent, light bluish-green beryl. Used as a gem.

**Aqueduct**—An artificial elevated way for carrying water.

**Aqueo-Igneous**—Commonly applied to rocks and minerals which have been produced by the combined action of water and heat.

**Aqueous Fusion**—Melting in the water of crystallization.

—**Lava**—The mud lava formed by the mixture of volcanic ash with condensing volcanic vapor or other water.

**Aquifer**—In hydrology, a water-bearing formation which creates a ground water reservoir.

**Arabesque**—In architecture, a light, lace-like surface decoration, either geometrical or naturalistic in nature.\*

**Arable Land**—Land which, in its present condition, is suitable without further improvement for the production of tilled crops.

**Aræostyle**—In architecture, signifying the intercolumniation to be  $3\frac{1}{2}$  diameters between columns.\*

**Aragonite**—Orthorhombic calcium carbonate,  $\text{CaCO}_3$ .

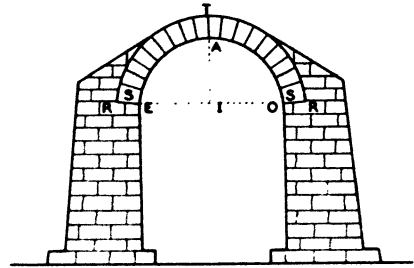
**Arc**—A portion of a curve. An arch.

**Arcade**—In architecture, a row of arches supported on piers or columns. The arches may be free-standing or engaged to the wall.\*

**Arch**—Any bow-like curve, structure, or object usually having a convex side upward, generally spanning an opening and producing horizontal as well as vertical reactions.

—**Barrel**—The arch member of a bridge, where the roadway is supported across its width by a single solid arch for each span.

—**Blind**—An arch in which the opening is walled up.



STS - ARCH  
EO - SPAN  
IA - RISE  
T - CROWN  
EAO - SOFFIT, OR INTRADOS  
RTR - BACK, OR EXTRADOS  
RE - RO-SKEWBACKS  
TR - HAUNCHES

### Arch Nomenclature

—**Bow String**—An arch having a bottom chord.

—**Braced**—An open-work truss in the form of an arch.

—**Catenary**—An arch which takes the form of an inverted catenary.

—**Centering**—Same as arch centre.

—**Centre**—A temporary structure for supporting an arch while in the process of construction.

—**Circular**—An arch which takes the form of a portion of a circle.

—**Crown**—The highest point of an arch rib or ring.

—**Crown Thrust of an**—The thrust or compression existing at the crown of an arch due to the loading.

—**Depth**—The depth of the arch ring at any point at right angles to the axis.

—**Elastic**—An arch designed on the basis of the elastic theory of materials.

—**Elliptical**—An arch having the form of a semi-ellipse.

—**Filled Spandrel**—An arch bridge, the roadway of which is supported by a fill of earth or other material over the arch ring.

—**Geostatic**—An arch which has a

- curve of such nature that the vertical pressure is proportional to the depth below a fixed horizontal plane, and the horizontal pressure bears to the vertical pressure a fixed ratio depending on the nature of the superincumbent materials.
- Hinged**—An arch which has one or more hinged joints.
  - Inverted**—An arch having its intrados below the axis or springing line.
  - Lenticular**—An arch which has a rib composed of two lens-shaped trusses.
  - Linear**—A linear arch is the equilibrium polygon for the system of loads applied to the physical arch. In an actual arch the resistance line is the linear arch for the actual loading.
  - Masonry**—That portion of the masonry in the arch ring only, or between the intrados and the extrados.
  - Multi-centered**—An arch having an outline composed of a series of circular arcs with different radii, giving an approximation to an ellipse. These arcs are symmetrically disposed about a vertical axis and occur in odd numbers.
  - Oblique**—An arch in which the axis is not perpendicular to the central plane of the structure.
  - Open Spandrel**—An arch bridge, the roadway of which is supported by spandrel columns or cross walls which rest upon the arch ribs or arch barrel.
  - Rib**—A rigid curved beam either solid or built up of members like a truss.
  - Ring**—That portion between the extrados and intrados of an arch, sometimes called an "arch barrel."
  - Rise of an**—The vertical distance from the springing line to the highest point of the intrados.
  - Segmental**—A circular arch in which the intrados is less than a semi-circle.
  - Skew**—Same as an "oblique arch."
  - Stilted**—(See stilted arch.)
  - Striking of**—Knocking out the wedges and lowering the centres, thus making the arch self-supporting.
  - Three-hinged**—An arch hinged at the piers, at the abutments, and at the crown.
  - Through**—An arch bridge in which the roadway is below the crown of the arch ribs.
  - Thrust of**—The horizontal reaction of an arch against its abutment. Also the resulting pressure normal to the face of a radial section of an arch ring.
  - Two-hinged**—An arch hinged only at the piers of abutments.
  - Arched Beam**—A beam arched on the bottom.
  - Dam**—A curved dam, convex up stream, depending in part on arch action for stability. The load is transferred by the arch to the canyon walls or other abutments.
  - Girder**—A girder which is cut, bent, or built in the shape of an arch.
  - Archeozoic**—The era during which, or during the latter part of which, the oldest system of rock was made.
  - Archimedean Screw**—A spiral screw, fitting closely in a tube, for raising water or other liquids; often used as a screw conveyor for grain, sand, gravel, and fine ore.
  - Archimedes Principle**—A body wholly or partly immersed in a fluid is buoyed up by a force equal to the weight of the fluid displaced. A body of volume  $V$  cm<sup>3</sup> immersed in a fluid of density  $d$  grams per cm<sup>3</sup> is buoyed up by a force in dynes  $F = dgV$ . A floating body displaces its own weight of liquid.
  - Architecture, Byzantine**—(See Byzantine Architecture.)
  - Architrave**—In architecture, the first horizontal division of the entablature. Also applied to the moulded

framework around doors and windows.\*

**Archivolt**—In architecture, the moldings on the face of an arch and following its contour.\*

**Area**—The amount of surface included between certain closed boundary lines; any particular extent of surface, region or tract.

—**Curves** (hydrology)—A graph of the cross-sectional area of a stream at a gaging station or other section; a graph of the surface area of a reservoir plotted against water-surface elevations or of the area of any structure.

—**Equivalent Flat-Plate**—The area of a square flat plate, normal to the direction of motion, which offers the same amount of resistance to motion as the body or combination of bodies under consideration.

—**Moment**—Sometimes called "area moment." The area enclosed by a moment curve.

—**Projected Propeller** — Projected blade area times the number of blades.

—**Projected Propeller-Blade** — The projection of the propeller-blade area on a plane perpendicular to the axis of rotation of the propeller.

—**Propeller**—Blade area times the number of blades.

—**Propeller-Blade** — The developed area of the blade face exclusive of the boss and the root; i. e., exclusive of that portion the thrust of which is negligible in comparison with the total thrust of the blade.

—**Propeller-Disk** — The total area swept by a propeller; i. e., the area of a circle having the same diameter as the propeller.

—**Sectional** — The area enclosed by the periphery of a section of a piece or member.

**Areal Geology**—That branch of geology which pertains to the distribution, position, and form of the areas of the earth's surface oc-

cupied by different sorts of rock or different geologic formations, and to the making of geologic maps.

**Arenaceous**—From the Latin word "arena," meaning sand. Like, or pertaining to sand. An example is arenaceous limestone, or a sandy limestone.

**Arenite**—A name for fragmental rocks of all sorts, whose grain size is that of sand.

**Arents Tap**—An arrangement by which the molten lead from the crucible of a shaft furnace is drawn through an inverted siphon into an exterior basin, from which it can be ladled without disturbing the furnace.

**Argental Mercury**—A silver amalgam.

**Argentiferous**—Silver-bearing.

**Argentite**—A sulphide mineral of silver, having the formula  $\text{Ag}_2\text{S}$ . Contains about 13 per cent sulphur and 87 per cent silver.

**Argil**—Potter's clay; white clay.

**Argillaceous**—Containing or consisting of clay. An example is argillaceous limestone, meaning one containing a high percentage of clay.

—**Sandstone**—A sandstone in which the cementing medium is clay or similar material, or it may be introduced later by circulating waters, as in some sandstones with carbonate cement, in which the cement is usually calcite.

**Argillite**—A synonym for slate.

**Argol**—Unrefined or crude tartar. A hard crust of potassium bitartrate formed on the sides of vessels in which wine has been fermented.

**Argon**—A colorless, odorless gas in the air, of which it constitutes almost 1 per cent by volume. Symbol, A; specific gravity, 1.4.

**Argus Powder**—An explosive mixture which contains 81 per cent potassium nitrate, 18.5 per cent charcoal, and 0.5 per cent sulphur.

**Arid**—In soil conservation, a term applied to lands or climates which lack sufficient moisture for agricultural use without irrigation.

**Ariegite**—A special family of granitoid rocks, consisting primarily of pyroxene and spinel.

**Arkansas Stone**—A true novaculite used as an oilstone for sharpening tools or instruments. Found in the Ozark Mountains of Arkansas.

**Arkite**—A name based on the common abbreviation Ark. for Arkansas, and commonly given to a rock which occurs near Magnet Cove, Ark.

**Arkose**—Is a sandstone composed of quartz and feldspar grains, usually derived from the disintegration of granite and not transported far.

**Arm**—The inclined member or leg of a set or frame of timber.

**Armature**—The rotating part of a motor, dynamo or magneto. It consists of a laminated iron cylinder or core keyed to a shaft, and in the slots of which are wound the armature coils of insulated copper wire or ribbon. At one end of the core on the shaft is mounted the commutator, a copper cylinder composed of insulated segments, which are connected to corresponding armature coils.

—That part of a dynamo, magnet, or motor said to be acted upon, or to act upon the lines of force set up by the poles of the field-magnet to produce power or motion.

—**Y-Connected** (electricity) — (See Y-connected armature.)

**Armor Coat**—(See double surface treatment.)

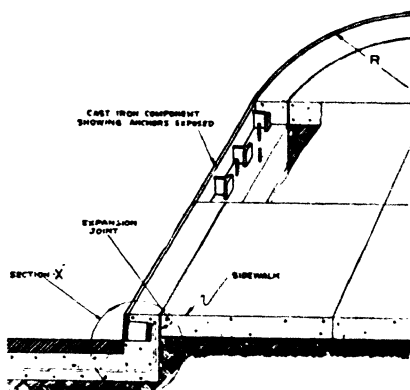
**Armor-coating**—Bitumen in quantity applied to the surface of a road and blotted up by an appreciable quantity of stone chips or sand, or similar suitable aggregate. Although the original surface may be sealed and strengthened as above, the result is a definite ad-

ditional layer of coated aggregate, rather than the strengthening and tightening of the original mat.

**Armored Cable**—An electric cable provided with a protective coating generally of metal tubing or wire.

**Armored Concrete**—Concrete construction which is protected along edges and on corners by steel or iron which is fastened into the concrete when poured.

—**Conductor**—In electricity, a conductor covered with a metal coating or covering to protect the insulation from abrasion.



*Drawing courtesy American Brake Shoe and Foundry Company.*

### *Armored integral concrete curb*

—**Hose**—Hose covered with a woven wire fabric, steel or other material, to protect it from injury or abrasion.

**Arquerite**—Silver amalgam containing only a small proportion of mercury.

**Arresting Gear**—The gear incorporated in aircraft and in the landing area to facilitate landing in a limited space.

**Arris**—The external edge formed by two surfaces, whether plane or curved, meeting each other. Example, the meeting of two channels in the Doric shaft.

—**Cleat**—A strip of wood having a

triangular cross-section used for keeping brattices in position.

**Arroyo**—Water-carved channel or gully in an arid country, usually rather small with high steep banks, dry much of the time because of infrequent rainfall and because not cut deeply enough to reach the level of permanent ground water.

**Arsenopyrite**—A sulpho-arsenide of iron,  $\text{FeAsS}$ , containing about 46 per cent arsenic, 20 per cent sulphur, and 34 per cent iron. Sometimes called "mispickel."

**Arsentine Plate**—German silver.

**Artesian Well**—A well bored down to a point, usually at great depth, where the water pressure, owing to the conformation of the strata, is so great as to force the water to the surface.

**Articulation, Sound**—(See sound articulation.)

**Artificial Horizon**—(1) A device that indicates the attitude of an aircraft with respect to the true horizon. (2) A substitute for a natural horizon, such as a liquid level, pendulum, or gyroscope, incorporated in a navigating instrument.

**Asbestophalt**—This product is a standard stone-filled sheet asphalt mixture in which asbestos fiber had been substituted for the limestone dust or filler. The mix is composed of proportionate parts of crushed rock, sand, asbestos fiber and asphalt cement. The material is mixed hot, at an asphalt plant and hauled in trucks to the roadway, where it is laid at 325 to 400 deg. F.

**Asbestos**—White, gray, or green-gray fibrous variety of amphibole, usually one containing but little aluminum, as tremolite or actinolite; also improperly a fibrous serpentine or chrysotile. Called also Earth-flax, Mountain-cork, and Amianthus.

—**Bonding**—A process of partly embedding the fibers of asbestos felt

in the galvanized coating of sheet metal to enable bituminous coatings to adhere more tenaciously.

**Ash**—Inorganic residue remaining after ignition of combustible substances, determined by definite prescribed methods.

—**Bed**—A deposit of volcanic ash.

—**Furnace**—A furnace or oven for fritting materials for glass making.

**Ashbed Diabase**—A name for a rock resembling a conglomerate, but which is interpreted as a very scoriaceous, amygdaloidal sheet, into which much sand was washed in its early history.

**Ashes (volcanic)**—Fragments of lava and pieces of rock driven upwards by violent expansion and expulsion. The material usually hardens in its passage and falls in solid form. According to size, those particles the size of peas are volcanic ashes.

**Ashlar**—Face stone, usually of rectangular dimensions, squared or cut on beds, face and ends and sometimes on back, so that joints do not much exceed  $\frac{1}{2}$  in. in thickness.

**Ash's Furnace**—A furnace for refining spelter.

**Asiderite**—Stony meteorites that lack metallic iron.

**Aspect Ratio**—The ratio of the span to the mean chord of an airfoil; i. e., the ratio of the square of the span to the total area of an airfoil.

—**Ratio, Propeller-Blade**—The ratio of the tip radius to the maximum blade width. (Obsolete.)

**Asperite**—A collective name for the rough cellular lavas whose chief feldspar is plagioclase.

**Asphalt**—Black to dark brown solid or semisolid cementitious materials which gradually liquefy when heated, in which the predominating constituents are bitumens all of which occur in the solid or semisolid form in nature or are obtained by refining petroleum, or which are combinations of the bi-

tumens mentioned with each other or with petroleum or derivatives thereof.

- Block Pavements**—Pavements in which the surface course is constructed of blocks composed of a dense fine graded aggregate asphaltic concrete which has been subjected to heavy compression during the process of moulding. These blocks are laid in regular courses as in the case of brick pavements.
- Blown**—(See oxidized asphalt.)
- Cement**—Refined asphalt, of a combination of refined asphalt and flux, of suitable consistency for paving purposes. It has a normal penetration of between 5 and 350. The term is often abbreviated to A. C.
- Filler**—An asphaltic product used for filling cracks and joints in pavement structures.
- Liquid**—(See liquid asphaltic road materials.)
- Macadam Pavement**—(See bituminous macadam.)
- Mastic**—A mixture of asphalt cement and mineral material in such proportions that upon heating it becomes a thick, slowly flowing mass which may be poured into place and compacted by trowelling to a smooth surface.
- Paint**—An asphalt product sometimes containing small amounts of other materials such as lampblack, and mineral pigments.
- Petroleum**—(See petroleum asphalt.)
- Plank**—A premoulded paving or flooring unit consisting of mineral aggregates, fibrous material, and an asphaltic binding agent.
- Refined**—(See refined asphalt.)
- Rock**—(See rock asphalt.)
- Asphaltenes**—The components of the bitumen in petroleum, petroleum products, malphas, asphalt cements and solid native bitumens, which are soluble in carbon disulfide but insoluble in paraffin naphthas.

**Asphaltic**—Similar to, or essentially composed of, asphalt.

—**Concrete**—Technically graded aggregates coated with hot bituminous cement (refined asphalt) and spread and rolled into a pavement.

—**Emulsion**—An emulsified asphalt or an emulsified asphaltic oil. (See bituminous emulsion.)

—**Petroleum**—Petroleum from which asphalt may be recovered by fractional distillation.

—**Residual Oil**—A liquid residue produced in petroleum refining, which contains little or no readily volatile constituents but yields asphalt upon evaporation at high temperatures.

**Assay**—To test ores or minerals by chemical or blowpipe examination as to composition, purity, weight, etc. To determine the proportion of metals in ores by smelting in the way appropriate to each. Gold and silver require an additional process called cupelling, for the purpose of separating them from the base metals.

—**Foot**—The assay value multiplied by the number of feet across which the sample is taken.

—**Pound**—A small standard weight used in assaying bullion, etc., sometimes equalling a half gram, but varying with the assayer.

—**Ton**—A weight of 29.166 $\frac{2}{3}$  grams used in assaying, for convenience.

**Assessment Work**—In mining, the annual work necessary to hold a mining claim.

**Assets**—Property of all kinds of a person, partnership, corporation, association, trust, or other legal entity. Includes everything of value belonging thereto; e. g., real estate, personal property, machinery, merchandise, cash, debts receivable, patent rights, etc.

—**Capital**—Property of a permanent nature or intended for long-continued use or possession, employed in or necessary for the conduct of an undertaking, and reflecting the

- investment of money or its equivalent.
- Current**—An appraisal term defined as property which in the regular course of business may be realized upon, such as cash, accounts receivable, and merchandise inventories; sometimes referred to as circulating or quick assets in distinction from capital assets or investment.
- Diminishing**—An appraisal term defined as those assets which by exploitation, consumption, lapse of time, or otherwise are periodically reduced in quantity. Such assets include mineral deposits, copyrights, franchises for a limited term, and similar exhaustible property. Timber lands are usually included in this category, although capable of conservation by proper reforestation.
- Fixed**—An appraisal term defined as the permanent property, synonymous with "capital assets"; usually consisting of land, buildings, machinery, equipment, rights and benefits (tangible and intangible) permanently employed in the rendering of a service for the production of a product, in distinction from property entering into the product produced and the service rendered.
- Intangible**—Permanent property of a non-physical nature, such as franchises, trade-marks, patents, copyrights, and good will; also such deferred items as development or organization expense, not subject to amortization within a short period.
- Physical**—An appraisal term defined as tangible property, both fixed and current; e. g., lands, mineral deposits, buildings, machinery, equipment, utensils, furnishings, rolling stock, merchandise, cash, growing crops.
- Tangible**—Permanent property of physical nature, such as lands, buildings, mineral deposits, plant equipment of all kinds, utensils, furnishings and construction materials intended for immediate use in permanent improvements.
- Assisting Gradient**—The inclination given to tracks of a railroad yard to facilitate the movement of cars.
- Associations, Technical**—(See technical societies.)
- Assumed Bonds**—When the control or ownership of a corporation passes into the hands of another corporation, the latter may agree to be responsible for the payment of both principal and interest of the bonds issued by the former corporation. The bonds are then called "assumed bonds."
- Astatic**—In electricity, devoid of magnetic polarity.
- Needle**—A magnetic needle whose directive power is not affected by the earth's magnetism.
- Astel**—Overhead boarding or arching in a mine gallery.
- Asteriated Quartz**—A phenocrystalline variety of quartz having whitish or colored radiations within the crystal.
- Atlantes**—In architecture, a carved male figure acting as a column in a building.\*
- Astragal**—In architecture, a small semi-circular moulding.\*
- Astringent**—A taste that puckers the mouth. Said of certain minerals.
- Astylar**—In architecture, a plane facade treatment of a building, no columns.\*
- A. T.**—In electricity, an abbreviation for ampere turn.
- Atmosphere** (a unit)—(See atmospheric pressure.)
- The ocean of air which surrounds the earth, and is composed of approximately 23 parts oxygen, and 77 parts nitrogen.
- Atmospheric Pressure**—The pressure of air at the sea level, exerted equally in all directions. The standard pressure is that under which

the mercury barometer stands at 760 millimeters. It is equivalent to about 14.7 pounds to the square inch.

**Atoll**—In geology, a ring-shaped growth of coral enclosing a lagoon.

**Atom**—According to the atomic theory, the smallest particle of an element that can exist either alone or in combination with similar particles of the same or of a different element.

**Atomic Weight**—The weight of an atom of a chemical element as compared with that of an atom of hydrogen.

—**Weight, Gram**—(See gram atomic weight.)

**Atomizer**—An apparatus for converting liquid into spray.

**Attached Business**—An appraisal term defined as the established organization, personnel, records, formulas, customers, trade connections, and other assets in addition to the fixed tangible assets, working capital and investments.

**Attack, Angle of**—(See angle of attack.)

**Attic**—In architecture, a low wall or story above the main order of a facade, in the classical styles; all the space next below the roof.\*

—**Base**—In architecture, a Classic column base composed of an upper and lower torus joined by scotia and fillets.\*

**Attitude**—The position of an aircraft as determined by the inclination of its axes to some frame of reference. If not otherwise specified, this frame of reference is fixed to the earth.

—**Of Flight**—Inclination of the three principal airplane axes to the relative wind.

**Attraction, Local**—Effect on the horizontal direction of the compass needle produced by the proximity of magnetic materials or electrical currents. Attraction is the same

in principle as what is called Deviation by navigators.

**Attrition**—Act of rubbing together; friction; act of wearing, or state of being worn; abrasion.

**Audible Sound, Ultra**—(See ultra audible sound.)

**Audiogram**—In acoustics, a hearing loss-frequency graph or a per cent hearing frequency graph.

—**Noise**—(See noise audiogram.)

**Augen**—The German word for eyes; used as a prefix before various rock names, especially gneiss, to describe larger minerals or aggregates of minerals in contrast with the rest of the rock. In the gneisses, feldspars commonly form the augen and are lenticular with the laminations in a way that strongly suggests an eye.

**Augen-gneiss**—In petrology, a general term for gneissic rocks, independently of their origin, containing "eyes"; i. e., phacoidal or lenticular crystals.

**Auger Stem**—The iron rod to which the bit is attached in well drilling.

**Augite**—The commonest rock-making pyroxene. As distinguished from other pyroxenes augite refers to the dark varieties with considerable alumina and iron.

**Augitite**—Non-feldspathic, porphyritic rocks consisting of a glassy groundmass, with disseminated augite and magnetite.

**Augitophyre**—A basalt containing phenocrysts of augite.

**Augustin Process**—The treatment of silver ores by chloridizing roasting, lixiviation with hot brine, and precipitation on copper.

**Aureole**—In petrology, a zone of contact-metamorphosed rocks surrounding an intrusion.

**Auriferous**—Gold-bearing.

**Authigenous**—An adjective used to describe those minerals which form in sediments after their deposition.

**Authorized Emergency Vehicle**—Vc-

hicles of the fire department (fire patrol), police vehicles and such ambulances and emergency vehicles of municipal departments or public service corporations as are designated or authorized by the commissioner of motor vehicles or the chief of police.

—**Issue**—In many cases the stockholders of a company authorize a larger bond issue than its present requirements demand, thus providing for future growth.

**Autoclastic**—Rocks which have been fractured and broken in place.

**Autogenetic Topography**—Conformation of land due to the physical action of rain and streams.

**Autogenic Soldering**—The process of uniting pieces of metal by merely fusing them together.

**Autogiro**—A type of rotor plane whose support in the air is chiefly derived from airfoils rotated about an approximately vertical axis by aerodynamic forces, and in which the lift on opposite sides of the plane of symmetry is equalized by the vertical oscillation of the blades.

**Automatic Gate**—In irrigation and hydraulics, a gate that operates through water pressure.

—**Pilot**—An automatic control mechanism for keeping an aircraft in level flight and on a set course. Sometimes called "gyro pilot," "mechanical pilot," or "robot pilot."

—**Propeller**—A propeller whose blades are attached to a mechanism that automatically sets them at their optimum pitch for various flight conditions.

—**Stability**—Stability dependent upon movable control surfaces automatically operated by mechanical means.

—**Valve**—(1) A spring-loaded relief valve fitted to the envelope, balloonet, or gas cell of an aerostat and set to open at a predetermined pressure for the purpose of preventing excessive internal pressure.

(2) A type of valve, used on some aerostats, which opens at a predetermined volume or hull dimension.

**Automorphic**—A word used to describe those minerals in rocks, which have their own crystal faces, as contrasted with the terms xenomorphic or allotriomorphic.

**Autotransformer**—In electricity, a transformer with one coil to which both primary and secondary circuits are connected.

**Auxiliary Airport Beacon**—A beacon light, usually of lower candlepower than the main airport beacon light, located on the airport site to indicate the specific location of an airport that has a separate airport beacon visible at a greater distance to indicate the general location of the airport.

—**Airway Beacon**—A beacon light, usually of lower candlepower than the principal airway beacon lights, used to mark special features of the terrain along an airway or otherwise to supplement the principal airway beacons.

**Avalanche**—The rapid descent of a mass of snow or ice, with or without some earth or debris, sliding down a mountain-side or other steep slope.

**Average Haul**—The average distance roadway grading material is to be hauled from cut to fill.

—**Velocity**—In irrigation and hydraulics, the arithmetical mean of velocities.

**Aviation**—The operation of aircraft heavier than air.

**Aviator**—The pilot of an aircraft heavier than air.

**Avogadro's Law**—One of the fundamental chemical laws that equal volumes of all gases and vapors contain the same number of ultimate particles or molecules at the same temperature and pressure.

**Ax, Brick**—(See brick ax.)

—**Jedding**—(See jedding ax.)

**Axed**—A stone masonry term mean-

ing dressed so as to cover the surface of a stone with chisel marks which are nearly or quite parallel.

**Axes of an Aircraft**—Three fixed lines of reference, usually centroidal and mutually perpendicular. The horizontal axis in the plane of symmetry, usually parallel to the axis of the propeller, is called the longitudinal axis; the axis perpendicular to this in the plane of symmetry is called the normal axis; and the third axis perpendicular to the other two is called the lateral axis. In mathematical discussions, the first of these axes, drawn from rear to front, is called the X axis; the second, drawn downward, the Z axis; and the third, running from left to right, the Y axis.

**Axial**—Pertaining to or of the nature of an axis.

—**Cable**—The axial member sometimes fitted in a rigid airship. It is attached to the central fitting of the radial or diametral wires of each main transverse and to the hull structure at bow and stern.

—**Cone**—(1) The cone-shaped fabric fitting, in the end of a gas cell of a rigid airship, which provides a gas-tight connection of the cell to the axial cable and yet permits the cell some degree of freedom in its movements. (2) A special form of conical sleeve.

—**Force**—A force acting along the geometric axis of a bar.

—**Stress**—A stress acting along the axis.

**Axial-Type Engine**—An engine having its cylinders equidistant from and parallel to the main shaft. Power is transmitted to the shaft through a wobble plate, swash plate, or gears.

**Axis**—A line about which a figure or a body is symmetrically arranged, or about which such a figure or body rotates. A principal line through the center of a figure or solid. A fixed line along which

distances are measured or to which positions are referred.

—**Eccentric**—An axis that does not pass through the center of gravity or the center of figure of the body considered. The axis about which an eccentric body revolves.

—**Elastic** (stress analysis)—The locus of all points through which a force may be applied to a structure without causing torsional deflection.

—**Longitudinal**—An axis in the longitudinal direction of the figure or body considered, and generally passing through the center of gravity or the center of figure.

—**Of Magnetism**—That imaginary line which passes through the center of a magnet connecting the two poles.

—**Neutral**—The trace of that plane in a beam where there is no tension or compression and where no deformation takes place.

—**Polar**—An axis at right angles to the plane of rotation.

—**Rotation of**—The imaginary line about which all the parts of a rotating body turn.

—**Wing**—The locus of the aerodynamic centers of all the wing sections.

**Axle Concentration**—The load from one axle of a locomotive or vehicle concentrated on a structure, or twice a wheel load.

—**Load**—The load which comes on an axle of a wagon, car, or locomotive and is in turn transferred to the structure.

**Ayr Stone**—A fine-grained stone used in polishing marble and giving a fine surface to metal work, particularly iron and steel, also as a whetstone.

**Azimuth** (of a line or a direction)—Angle between the plane of the meridian and the vertical plane through the given line; or, the horizontal angle to the right from the true south to the line of direction in question. Astronomic

**Azimuth**—Same, when the horizon is perpendicular to the direction of gravity. **Geodetic Azimuth**—Same, when the horizon is perpendicular to a normal to the spheroid. **Plate Azimuth** — (aerial photographic mapping) The azimuth of the principal plane on the ground co-ordinate system. (In mapping operations, the United States Army measures azimuth from the north point. The Coast Artillery uses the south point for triangulation, but the north point in other instances. The United States Navy uses the north point. The United States Coast and Geodetic Survey and the United States Geological

Survey use the south point.) See, also, **Bearing**.

**Azimuth Circle**—An instrument for measuring azimuth, having for its chief characteristic a graduated horizontal circle.

**Azrock**—This is the trade name for a group of products marketed by a Texas rock asphalt producer. Natural bituminized limestone rock is quarried, crushed and pulverized to a fine grading. The material is laid cold.

**Azurite** — A blue copper mineral,  $3\text{CuO} \cdot 2\text{CO}_2 \cdot \text{H}_2\text{O}$ , containing 26 per cent carbon dioxide, 69 per cent cupric oxide, and 5 per cent water. An ore of copper.

- B. and B.**—Letters used in roadside planting specifications to denote trees or plants that have their roots balled with earth and burlapped.
- Babbitt Metal**—A soft, white, anti-friction metal of varying composition, as of 4 parts of copper, 8 of antimony, and 24 or 96 of tin.
- Bacile**—In ceramics, a basin or deep dish of or resembling Italian enameled and lustered pottery.
- Back**—In stone masonry, the rear face of a wall.
- Focal Distance** — (photography) The distance between the rear focal plane of a lens and the rear surface of the lens, measured along the lens axis. (This term is not synonymous with either Focal Length or Principal Distance.)
- Holes**—In shaft sinking, raising or drifting, the round of holes which is shot last.
- Leads**—A term applied to black sand "leads" on coast lines which are above high-water mark.
- Of Levee**—Slope of levee away from river.
- Of Ore**—In mining, the ore between two levels which has to be worked from the lower level.
- Voltage**—In electricity, that term which refers to the counter electromotive force of self-induction.
- Slope**—That portion of the roadway in cuts which (from the center line) is beyond the side ditches.
- Plank on back of timber abutments or wings, for retaining backfill.**
- Earth deposited behind a retaining wall or a stone masonry structure; backfill.**
- The timbers fixed across the top of a mine level, supported in notches cut in the rock.**
- Plate**—The amalgamated plate inside and at the back of the mortar box of a stamp mill.
- Wall**—A wall projecting from the bridge seat to the top of the earth fill, to prevent the earth from flowing onto the bridge seat, and to support the approach slab.
- Backfill**—Earth or other material used to replace material removed during construction, such as in culvert and pipe line trenches and behind bridge abutments; also refers to material placed between an old structure and a new lining.
- Backfire**—A fire started intentionally ahead of an advancing fire to remove inflammable material by controlled burning and thus stop or control the main fire.
- Backflow**—The backing up of water through a culvert, sewer, or other drainage channel in the direction opposite to normal flow.
- Backing**—That portion of a masonry wall or structure built in the rear of the face course.
- Backjoint**—In masonry, a rabbet or chase left to receive a permanent slab or other filling.
- Strip**—In welding, a piece of material used to retain molten metal at the root of the weld and/or increase the thermal capacity of the joint so as to prevent excessive warping of the base metal.
- Backlash**—The return or counterblast, as the recoil or backward suction of the air current produced after a mine explosion; the re-entry of air into a fan; the lost motion in gearing or any working mechanism due to poorly fitting parts.
- Backsight**—(transit traverse) A sight on a previously occupied instrument station.
- (Leveling)** The reading on a rod that is held on a point of known elevation, and which is to be used for computing the Height of In-

strument. (A Backsight is often called a Plus Sight, because it is added to the elevation of the point to obtain the height of instrument. It is not, however, essentially a positive quantity; for example, when the rod is held inverted on points overhead, as in mine and tunnel surveying, the reading is negative. The term Plus Sight is recommended as preferable; but the older term, Backsight, is still in general use.)

**Backshore**—(See diagram near definition of beach.)

**Back-Stay**—A rope, cable, or structural member extending backward from the head of a mast and fastened to some permanent object. A rear cable in a suspension bridge running from the top of tower to the anchorage.

—A wrought iron forked bar attached to the back of cars when ascending an inclined plane, which throws them off the rails if the rope or coupling breaks.

**Backstop** (jacking)—The bracing or support against which the thrust of a jack is applied when jacking a pipe through the earth.

**Back Stope**—To mine a stope from working below.

**Backswept**—(See sweepback.)

**Backwall Hitch**—A hitch or method of fastening a rope to a hook without clamps. Formed by wrapping the rope around the hook and placing the loaded part of the rope on top of the wraps.

**Backwater Curve** (hydraulics)—A particular form of surface profile assumed by a stream above a point at which the depth is made to exceed the normal depth by a constriction or obstruction in the channel. The depth is greater than the normal depth throughout the extent of the profile and the velocities diminish downstream. The term is sometimes used in a gen-

eric sense to denote all water-surface profiles.

**Bacteria**—The smallest known living organisms, of very simple construction and without chlorophyl. They are parasitic or saprophytic.

**Badlands**—In soil conservation, minutely dissected topography developed by rill wash on a series of weak sedimentary rocks or deposit of unconsolidated sands, clays, and gravels usually presenting marked differences in the resistance of successive layers.

**Baffle**—In mining, to brush out fire-damp.

—Deflector of wood, metal, or masonry placed in flowing liquid to divert, guide, or agitate the flow of such liquid.

—**Piers** (hydraulics) — Obstructions set in the path of high-velocity water, such as piers on the apron of an overflow dam, to dissipate energy and prevent scour.

—**Plate**—A metal plate used to direct the flames and gas of a furnace to different parts so that all portions of it will be heated.

**Baffles** (hydraulics)—A set of vanes or guides; a grid, grating, or similar device placed in a conduit to check eddy currents below them, and to effect a more uniform distribution of velocities.

**Bag Dam**—In soil conservation, a dam made of bags partly filled with soil or concrete.

—**House**—A large room or chamber, or series of rooms at metallurgical blast-furnace plants in which 3,000 to 4,500 bags are suspended for filtering furnace gases.

**Bailing Drum**—A light winding drum from 10 to 18 feet in circumference, fixed in the derrick, usually driven by belting from a motor, around which the bailer rope is coiled.

**Bail of Socket**—The "U" shaped loop on a closed socket holding a rope end.

**Baking**—In geology, the hardening of rock material through the influence of magma or lava. Shale may become a very hard hornstone, and quartz sandstone may become quartzite.

—A condition of steady flight in which the resultant force and moment on the airplane are zero.

—**Gate**—A gate hung in the middle on a horizontal or vertical axis, as a flood gate, to facilitate turning in a current.

**Balance, Westphal**—(See Westphal balance.)

**Balanced Armature**—In electricity, an armature whose weight is symmetrically distributed about the axis.

—**Cross-Section**—In Portland cement concrete pavement, a section in which unit stresses have the same maximum value, when a load is placed at various points so as to produce the maximum unit stress at each point.

—**Or Reversible Action**—In chemistry, one which can be caused to proceed in either direction by suitable variation in the conditions of temperature, volume, pressure or of the quantities of reacting substances.

—**Shot**—In coal mining, a shot for which the drill hole is parallel to the face of the coal that is to be broken by it.

**Balancing a Traverse**—Adjusting the observed measurements to conform to the geometrical requirements of the traverse. Balancing involves: (1) Distributing the angular error of closure so that the initial and final azimuths are in agreement, or so that the algebraic sum of the angles equals its theoretical amount (for example,  $360^\circ$  in the case of deflection angles, or  $(n-2) 180^\circ$ , in the case of interior angles; (2) distributing discrepancies in latitude and departure so that the algebraic sum of the latitudes and

the algebraic sum of the departures each becomes zero (if the traverse closes on itself), or some known amount (if the traverse is run between two fixed points, such as triangulation stations).

**Balata**—An electrical insulating material, and when prepared for use as such, is somewhat like gutta-percha.

**Bald**—Without framing. Said of a mine timber which has a flat end.

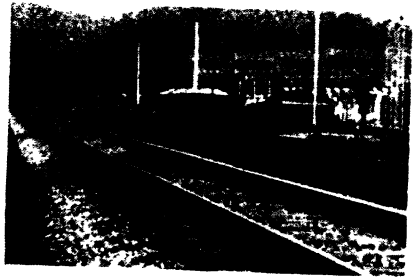
**Balk**—A large stick of timber.

**Ballast**—In marine use, sand, rock, water or other material carried in a ship without, or with little cargo, for the purpose of steadying the ship in rough seas.

—In railroad use, broken stone, gravel, sand, etc., used for keeping railroad ties in place.

—Stone placed on any wood mattress to sink it and to make it conform to the river bed.

—Heavy material carried by a moving unit to keep it held down or steady.



*Ballast between ties and roadbed*

—**Cleaner**—In railroad work, any device by which dirt or other foreign matter is removed from broken stone, hard slag or prepared gravel ballast.

—**Coil**—In electricity, that coil designed to limit the flow of current in a circuit.

—**Crusher**—A machine designed to crush or recrush stone and boulders to sizes suitable for ballasting

- railway tracks. The usual types are the gyratory, jaw and disc crushers.
- Curb**—A longitudinal timber placed along the outer edge of the floor on ballast deck railway bridges to retain the ballast.
  - Discer**—A device consisting of a set of discs attached on either or both sides of a railway motor car, and placed so as to run at an angle with the railway track, each set containing one or more discs designed to remove plant growth, promote drainage and improve the contour of the railway ballast section.
  - Hammer**—A hammer with a long handle and two faces, used to break stone ballast.
  - Plow**—A device for plowing stone from between railroad rails, or designed to be pulled over flat or convertible railroad cars to unload ballast by scraping and pushing it from the sides and distributing it along the tracks. It may be made center, right or left hand.
  - Shovel**—A spoon-pointed shovel having a thick body.
  - Tamper**—A portable machine actuated by compressed air or electricity, or other mechanical device for compacting ballast under the ties of railway track.
  - Unloader**—A railway friction drum machine operating device, consisting essentially of an engine, usually connected horizontally and in tandem to a grooved steel drum, around which may be wound a cable used to pull a ballast plow over railroad cars loaded with ballast or filling material.
  - Ball Breaker**—A steel or iron ball that is hoisted by a derrick and allowed to fall on blocks of waste stone pavement surfaces, or scrap iron for the purpose of breaking them.
  - Clay**—A plastic white burning clay used as a bond in chinaware. Called also pipe clay.
  - Iron**—An iron ore containing clay.
  - Joints**—A cast iron pipe with special ends that permit a deflection of the pipe line, after the lead has been poured.
  - Ball-Bearing Jack**—A jack having ball bearings to take up the thrust from the load and reduce the friction of operation.
  - Balling Furnace**—A furnace in which the fagots of metal are placed to be heated, preparatory to working.
  - Tool**—A hand tool used for collecting into a mass the iron in a puddling furnace.
  - Ballonet**—A gas-tight compartment of variable volume constructed of fabric and placed within a balloon or airship. It is usually partly inflated with air to compensate for changes of volume in the gas contained in the envelope.
  - Ceiling**—The altitude from which a pressure airship with empty balloons can return to sea level without loss of operating pressure.
  - Balloon**—An aerostat without a propelling system.
  - Fabric**—(See fabric, balloon.)
  - Balsam, Canada**—(See Canada balsam.)
  - Baltimore Truss**—(See truss, Baltimore.)
  - Baluster**—In architecture, a dwarfed column or pillar supporting a railing or coping. A series of balusters form a balustrade.\*
  - Banakite**—A name given to a group of igneous rocks in the eastern portion of the Yellowstone Park. They are porphyritic and richly feldspathic.
  - Banatite**—The dioritic rocks connected with a series of ore deposits in the Austrian province of Banat. The rocks are largely quartz-diorites.
  - Band**—Slate or other rock interstratified with coal. Commonly called Middle band in Arkansas; also

Dirt band, Sulphur band, or other band, as the case may be.

—(Connection) A collar or coupling which fits over adjacent ends of pipe to be joined, and which when drawn tight, holds the pipe together either by friction or by mechanical bond.

—**Screen**—An endless band or belt of wire mesh, bars, plates, or other screening medium, which passes around upper and lower rollers or guides.

—**Wheel**—The belt wheel on the axis of the drum which drives the walking beam of a well drill.



*Photo courtesy Armco Culvert Mfr's Ass'n  
Culvert connection band*

**Banded**—A term applied to rocks having thin and nearly parallel bands of varying colors, minerals or textures.

**Bank**—The position of an airplane when its lateral axis is inclined to the horizontal. A right bank is the position with the lateral axis inclined downward to the right.

—To incline an airplane laterally; i. e., to rotate it about its longitudinal axis.

—**Gravel**—Gravel found in natural deposits, usually more or less

intmixed with fine material, such as sand or clay or combinations thereof; gravelly clay, gravelly sand, clayey gravel and sandy gravel, indicate the varying proportions of the materials in the mixture.

—(Or banking) **Indicator**—(See turn-and-bank indicator.)

—**Protection**—In soil conservation work, riprap, paving, brush or other work done to prevent erosion on a stream or lake bank.

—**Storage**—In soil conservation, water absorbed by the bed and banks of a stream or reservoir and returned in whole or in part as the water level falls.

**Banquette**—Additional embankment or shoulder on land side of levee for the purpose of preventing the line of saturation reaching the surface of the levee slope, also to provide a break in the surface drainage.

**Bar** (in body of water)—A shelving elevation of earth or sand which rises considerably above the adjacent area of the bottom of a waterway.

—Any piece of wood, metal or solid material long in proportion to its cross-section. Also a barrier.

—**Anchor**—An eye-bar extending from the shoe of a span or tower into the concrete or masonry of the supporting pier or abutment for the purpose of holding down the span that rests thereon in case that it be subjected to uplift.

—**Arbitration Test**—A form of small test bar used for determining the quality of material going into a casting.

—**Armature**—In electricity, a motor or generator armature having copper bars instead of the general wire windings.

—**Bearer**—(See bearer bar.)

—**Boring**—(See boring bar.)

—A machine tool consisting of a special bar with cutters attached,

- used in a lathe or boring machine.
- Bucking**—The bar on a ring dolly which bears against a rivet, so as to hold the head during driving.
  - Buffer**—(See buffer bar.)
  - Chisel**—A heavy hand bar with a chisel edge on one end.
  - Claw**—A hand bar with a bent, claw-shaped point for drawing spikes from railway ties or sleepers.
  - Connecting**—A bar which joins two parts or two members.
  - Corrugated**—A type of deformed bar used as reinforcement in concrete.
  - Crow**—A hand bar of steel with a slightly bent, wedge-shaped end, which is sometimes forked.
  - Culm**—(See culm bar.)
  - Deformed**—(See deformed bar.)
  - Dolly**—A riveter's tool or bar, used to hold the head of the rivet against the metal and act as an anvil while the other head is being made by a hammer.
  - Dowel**—(See dowel bar.)
  - Extension**—A bar riveted to the end of a strut channel and projecting beyond it, to permit the passage of a pin.
  - Eye**—A steel rod with a hole (or eye) at one or both ends.
  - Holding-on**—A lever which is used to hold one head of a rivet against the impact of the hammer while the other head is being formed with a snap.
  - Iron**—Iron made up in the shape of bars.
  - Lacing**—Any bar used in a system of "lacing."
  - Merchants**—Wrought-iron bars in their finished form ready for sale.
  - Muck**—The bar made by the first rolling of the bloom.
  - Pinch**—A form of crow-bar with a short projection like a heel, or fulcrum at the end. Used to pry forward heavy objects.
  - Rack**—A screen composed of parallel bars, either vertical or inclined, from which screenings may be raked.
  - Reinforcing**—A bar or rod placed in concrete construction to increase their resistance, especially to bending and shear.
  - Rudder**—(See rudder bar.)
  - Screen**—A device for separating different materials or solids and trash from water or liquor. It consists of a number of parallel inclined bars at regular distances apart.
  - Shackle**—A bar used for pulling driftwood from a stream.
  - Tension**—Any bar subjected to tension.
  - Test**—A sample bar used in testing the material.
  - Tie**—A narrow steel plate or small diameter rod connecting two parts of a steel member, or two parts of a structure. (See tie bar.)
  - Windings**—In electricity, those armature windings composed of heavy copper bars.
  - Z**—A rolled steel shape having a cross-section resembling the letter "Z" and all angles right angles.
- Barbados Tar**—The dark green or black petroleum of Barbados, which was formerly used widely in medicine.
- Bardiglio Marble**—An Italian stone obtained on Montalto, on the southern borders of Tuscany.
- Barff's Process**—A method of protecting iron from rusting by oxidizing it with superheated steam.
- Barge**—A square-ended, flat-bottomed boat having capacity to carry bulky materials such as coal and rock. Used for erecting spans by flotation.
- Barite**—Sulphate of barium,  $\text{BaSO}_4$ ; also called Heavy-spar, from its high specific gravity. When finely ground it is used as an ingredient in certain paints, especially in place of white lead.
- Barium**—A chemical element belong-

ing to the group of metals whose oxides are the alkaline earths. It is yellowish white, somewhat malleable, fusible at high temperature, burning easily when heated in air. Sp. gr. 3.6.

**Barometer**—(See aneroid barometer.)

**Barrage**—In irrigation and hydraulics, a dam.

**Barranca**—A Spanish term meaning a deep ravine, gorge, or gully with steep sides.

**Barrel**—The under surface of an arch.

**Barricade**—Temporary wooden structure erected across the highway or street, or alongside a ditch, or in front of an excavation, to prevent access thereto, together with warning signs, lights, and de-tour signs.

—An obstacle to prevent travel in a definite direction.

—An artificial mound of earth, usually as high as the eaves of a powder magazine roof, erected to deflect the force of an explosion upward and to protect the inclosed building from flying objects.

**Bartlett Table**—A three-shelf table driven by an eccentric that gives it a vanning motion. Ore and water are fed on the upper shelf, giving two products, heads and tailings. The latter are retreated on the second shelf and the tailings go to the third or lower shelf for retreatment.

**Barysphere**—The central or deep interior portions of the earth, presumably composed of heavy metals or minerals. It is contrasted with Lithosphere, the outer stony shell.

**Basal Conglomerate**—A conglomerate or coarse sandstone forming the lowest member of a series of related strata which lie uncomformably on older rocks. It records the encroachment of the seabeach on the former dry land.

**Basalt**—Any volcanic rock of micro-crystalline or amorphous texture, dark color and high true specific

gravity, indicating porous or volcanic basalt which by reason of its structure has a low apparent specific gravity. Mineralogically, basalts consist chiefly of plagioclase feldspar, augite, olivine, and magnetite. The groundmass sometimes contains large amounts of dark glass.

**Bascule**—A moving span that rotates in a vertical plane about an axis that may be either fixed or movable.

—**Leaf**—That portion of a bascule which actually revolves in a vertical plane.

—**Roller-bearing**—A type of bascule which has a fixed axis of rotation and which is supported on friction rollers to reduce the resistance to turning.

—**Rolling**—A bascule which retreats as it rises by having a cylindrical surface roll on a plane. In some types both surfaces are toothed.

—**Trunnion**—A type of bascule which is supported by an axle or trunnions, about which it rotates without translation.

**Base** (road construction)—Any construction different from and placed directly upon the natural-soil foundation, the soil-substructure or the sub-base, and upon which a wearing surface of different design is placed. Example: When a monolithic concrete slab is covered with bituminous material, the concrete is the base, and the bituminous material is the wearing surface.

—An artificial foundation.

—The bottom side of a structure.

—**Bullion**—The commercial name for argentiferous lead, as distinguished from silver or gold bullion.

—Chemically, any substance which yields hydroxyl ions.

—**Level**—The level below which a land surface cannot be reduced by running water; to reduce by erosion to or toward a base level.

—Elevation of the bottom of a structure.

- Base Line**—A line taken as the foundation of operations in trigonometrical and geological surveys.
- (triangulation)—A line forming one side of a triangle (usually in a connected series of triangles), and measured with great accuracy, from which all other distances are calculated; a "base" may consist of two or more lines ("broken base"), although in accurate work this is not desirable.
  - (traversing) The main traverse running through the site of proposed construction, from which property lines, street lines, buildings, etc., are located and plotted on the plan. (This is probably not a correct use of term; it is not recommended.)
  - (construction) The center line of location of a railway or a highway, often called "base-line of location"; a reference line for the construction of a bridge, or other structure.
  - (public land survey) The parallel of latitude established through the initial point of a system of co-ordinated township boundary lines.
  - (aerial photographic mapping) See Air Base.
  - Metal**—Any metal, as iron, lead, etc., which is altered by exposure to the air, etc., in contrast with the noble or precious metals.
  - In welding, the parent material welded or cut.
  - Pig**—Pig iron used in making basic open-hearth steel in which the silicon content is limited to one per cent and the sulphur to one-half of one per cent.
  - Plate**—Plate upon which a bridge rocker or roller rests.
  - The foundation plate of metal on which a heavy piece of machinery or the end of a bridge rests. This plate is usually set on masonry or concrete.
  - Width**—The horizontal distance from the center of a terrace channel to the foot of the embankment on the downhill side of the terrace ridge.
  - Baseness**—(1) Liability to rust; (2) inferiority due to alloy.
  - Basic**—A term applied to rocks in which the iron-magnesia minerals and feldspars with lime and soda predominate, such as diabase or basalts.
  - Frequency**—In acoustics, the basic frequency of any wave is that frequency which is considered to be the most important. In a driven system it would in general be the driving frequency, while in most periodic waves it would correspond to the fundamental frequency.
  - Lining**—A lining for furnaces, converters, etc., formed of non-siliceous material, usually limestone dolomite, lime, magnesia, or iron oxide.
  - Load** (stress analysis)—The load on a structural member or part in any condition of static equilibrium of an airplane. When a specific basic load is meant, the particular condition of equilibrium must be indicated in the context.
  - Salt**—A salt in which the acid part of the compound is not sufficient to satisfy all the bonds of the base.
  - Slag**—The word "basic" is applied in a mineralogical sense to indicate a preponderance of lime and magnesia compounds over the other constituents.
  - Basil**—The angle at the cutting edge of a tool or instrument.
  - Basin**—A large or small depression in the surface of the land, the lowest part of which may be occupied by a lake or pond; an area or tract having certain common features throughout, particularly a tract where the strata dip from all sides toward the center.
  - A mooring area for vessels, nearly surrounded by land, usually provided with wharves and sometimes provided with a guard lock to permit the entrance and exit of vessels without fluctuation of water level.

- Irrigation**—A method of irrigating orchards whereby each tree is surrounded by a border to form a pool when water is applied.
- Towing**—(See tank, seaplane.)
- Basis Metal**—In electroplating, the metal to be plated.
- Basket**—The car suspended beneath a balloon for carrying passengers, ballast, etc.
- Of Socket**—The hollow tapered part into which the rope is inserted.
- Suspension**—(See suspension basket.)
- Basque**—A lining for crucibles or furnaces; generally a mixture of clay, etc., with charcoal dust.
- Bastard Granite**—A quarry term for gneissic granites.
- Bat**—A part of a brick or stone.
- Bolt**—A bolt barbed or jagged at the butt, or tang, to give it a firmer hold.
- Batch**—A charge placed in a mixer.
- Mixer**—A concrete mixer in which all the ingredients for a "batch" of concrete are placed at the same time, and no additional materials (except water) added during the mixing period, or until the "batch" is completely discharged from the mixer.
- Bath**—A medium as sand, oil, water, or air for regulating the temperature of anything placed in or upon it; also the vessel containing such a medium.
- Metal**—Any one of several varieties of brass.
- Batholith**—A large, irregular intrusive mass of igneous material. They are usually located in mountain-making zones, the roof is irregularly dome-shaped, the lateral walls steeply inclined and fairly smooth. It is stated that the igneous mass appears to enlarge downward, with no floor visible. However, Chamberlain has reported a batholith having a floor. The composition of batholiths is usually granitic or granodioritic.
- Bathymetric**—Relating to measurement of depths; usually applied to the ocean.
- Batten**—A board or plate fastened across a group of parallel boards or metal structural members to hold them together. Often called batten plate.
- A strip of wood used for nailing across two other pieces to hold them together or for covering a crack.
- Plate**—A stayed plate at the end of a compression member. Sometimes termed tie plate or stay plate.
- Batter**—A deviation from the vertical in upright members of a trestle bent.
- The slope or inclination of the face or back of a wall from a vertical plane. Also called Battice.
- To strike with repeated blows.
- In railroad use, the deformation of the surface of the head of the rail in the immediate vicinity of the end.
- Brace**—The inclined end post of a truss, sometimes called the "Batter Post."
- Pile**—A pile driven at an angle to take up the lateral thrust of an engineering structure or to resist the impact of a vessel in docking.
- Battice**—(See batter.)
- Batting Block**—In ceramics, a plaster slab on which plastic clay is beaten before going to the whirling table.
- Battledeck Floor**—A steel floor system for bridges and buildings, devised and developed by the A.I.S.C., and consisting of steel plates and beams welded together so as to develop the whole as a T-beam section with continuity in all directions.
- Batture**—That portion of river bank immediately above the foreshore that at times is submerged.
- That portion of bank between levee and foreshore if levee is in close proximity to river.

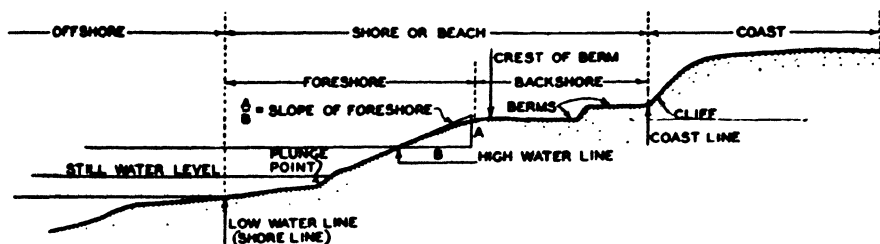
**Bay**—The portion of a trestle between two columns.

—A panel in a truss.

—A section of wall between two columns.

**Bayou**—A sluggish or stagnant inlet or outlet from a lake or bay, or one connecting two bodies of water.

**Beach**—A portion of shore line whereon sand has been deposited in a fairly level manner.



*Diagram showing nomenclature of beach and coast line. Submitted by American Shore and Beach Reservation Association*

**Beaching Gear**—An arrangement of wheels to be attached to the hull of a seaplane to permit handling ashore.

**Beacon**—A light used as an aid to navigation.

—A light, group of lights, or other signaling device, indicating a location or direction.

—**Radio-Marker**—(See radio-directive devices.)

—**Radio-Range**—(See radio-directive devices.)

**Bead**—In architecture, a small cylindrical moulding frequently carved to resemble beads.\*

**Beam**—A structural member, the principal function of which is to carry a transverse load.

—A strip of light.

—The greatest width of a ship's hull.

—**Box**—A hollow beam, generally rectangular in section, having its sides made of plates united by angle-irons.

—**Built**—A beam made up of struc-

tural shapes, such as plates and angles riveted together.

—**Cantilever**—A beam supported at only one end.

—**Collar**—A horizontal member stretching between two rafters which meet at the top, and which are above the main tie-beam.

—**Compass**—An instrument consisting of a wooden or brass beam having sliding sockets that carry steel or pencil points, used for

describing large circles and for laying off distances.

—**Continuous**—A beam that rests on three or more supports.

—**Cross**—A beam which runs transversely to the center line of a structure.

—**Deck**—A rolled shape having a "T" cross-section but with a slight enlargement at the lower end of the stem or web.

—**Direction** (stress analysis)—The direction parallel to the plane of the spar web and the plane of symmetry of an airplane (cf. chord, drag, lift, and side directions).

—**Force or Component** (stress analysis)—A force, or component, in the beam direction; i. e., parallel to the plane of the spar web and the plane of symmetry of an airplane (cf. chord, drag, lift, and side forces).

—**I**—A rolled structural shape having a cross-section resembling the letter "I."

—**Needle**—A cross-beam supporting a load, used in underpinning walls.

—**Rolled**—A metal beam made by a rolling process.

—**Simple**—A beam having its ends free and resting on two supports.

- T**—A reinforced concrete beam or a rolled structural shape having a cross-section resembling the letter "T."
- Tension**—A beam subjected to tension as well as to cross-bending.
- Transverse**—Any beam of a bridge that passes from one truss to an adjacent truss.
- Trussed**—A beam braced by one or more vertical posts supported by inclined rods attached to the ends of the beam.
- Beam-Hanger Plate**—The plate beneath the ends of a floor beam for the beam-hanger nuts to press against.
- Beam-Trussing Posts**—The short, perpendicular posts used in trussing beams.
- Bear Market**—When the trend of prices of the majority of stocks and bonds is downward, we refer to the movement as "a bear market." The "bears" are investors or speculators who are selling their holdings with the expectation that prices will continue to fall.
- Trap Dam**—An obstruction built of hinged leaves that are raised and held up by the pressure of water admitted to the inside. The dam is lowered by draining the interior.
- Bearer Bar**—One of the bars which support the gratebars in a furnace.
- Bearing**—The angular position of a line referred to a meridian. The support for a shaft, axle, or trunnion. The shoes for a span. The support for a beam, pin, bolt, or rivet.
- Horizontal angle between the meridian (true or magnetic) and any specified direction. The angle is measured from either the north or the south point, as may be required to give a reading of less than  $90^\circ$ , and the proper quadrant is designed by the letter N or S, preceding the angle, and the letter E or W, following it; as, N  $80^\circ$  E. ("True bearings" are measured from the geographic meridian; "magnetic bearings," from the local magnetic meridian. In navigation, bearings greater than  $90^\circ$  are used. In early documents of record, bearings counted from the east or west point will be found.)
- (land surveys, Texas) A preference point or witness to identify a land corner or a point on a survey line.
- Anti-Friction**—The points of support of a revolving axle, shaft or other part moving in contact with another, so designed as to reduce friction. Anti-friction bearings are usually: (a) ball bearings, which may take either radial or thrust pressure or both, (b) roller bearings, which may take either radial pressure only, or both radial and thrust pressure.
- Allowable**—The maximum intensity of pressure on a support allowed by the specifications.
- Axle**—The bearing in which the axle of a motor car or trailer or other unit of roadway machinery turns. If of anti-friction type, it includes inner race, balls or rollers, outer race, housing and pedestal, the housing and pedestal being commonly in one piece.
- Center**—A term applied to swing bridge spans to indicate that the dead load support is near the axis of the pivot pier instead of near the periphery thereof.
- Even**—A bearing in which the pressure is uniformly distributed.
- Expansion**—A support at the end of a span where provision is made for the expansion and contraction of the structure.
- Frame** (jacking)—A frame for distributing the thrust from a jack evenly over the end of a pipe being jacked into the ground.
- Pin**—A type of end support for a girder or a truss in which a pin is used to transfer the load to the shoe.

- Plain**—The points of support of a revolving shaft or other surface moving in contact with another as the face of a thrust collar.
- Plate**—A plate of cast or wrought iron placed on a wall, pier or abutment to support the ends of beams, trusses or columns.
- Point**—The point of a support for a load or a place where concentrated pressure is applied.
- Power**—The unit load-carrying capacity of subsoils, piles, or any material.
- Projector**—A fixed directional projector used in conjunction with a landmark beacon to indicate the direction toward a landing area by means of the direction of its beam.
- Rim**—A term applied to swing spans to indicate that the dead load is supported by a circular girder near the periphery of the pivot pier instead of near its axis.
- Rocker**—A bearing, or support, for solitary trestle bents or cantilever spans which permits of a slight rocking with the changing position of the live load and with variations of temperature.
- Roller**—A shoe or plate resting on rollers which in turn rest on a base casting at the expansion end of the span.
- Sliding**—A bearing constructed so that one part slides on another.
- Thrust**—A support for a shaft adapted to take up the end thrust therefrom.
- Beater**—A bridgeman's maul.
- Beats**—In acoustics, the periodic variations of the amplitude of the sound pressure or the particle velocity at a point due to the interference of two sound waves of different frequencies.
- Beaufort Scale**—A scale used by seamen showing the velocity of the wind in statute miles per hour with the corresponding velocity in nautical miles per hour and the terms applied to the various limits of velocity.

**Becke Test**—In optical mineralogy, a test for relative indices of refraction.

**Bed**—A common structure of sedimentary rocks. Beds may be extremely thin or as much as 100 feet thick, but a more common range is from 3 or 4 inches up to 2 or 3 feet.



*Bedding in a sand-gravel deposit. Note the fine material resting upon the coarse gravel.*

- The top or bottom of a stone.
- Brick**—(See cement sand bed and cushion course.)
- Joint**—A horizontal joint, or one perpendicular to the line of pressure.
- Load**—In soil conservation, silt, sand, gravel, or other detritus carried by a stream on or immediately above its bed, often expressed as weight or volume per unit of time.
- Mastic**—(See mastic bed.)
- Plain or Sand**—(See plain or untreated bed.)
- Plate**—Same as base plate.
- Bedding**—The earth or other materials upon which a pipe or conduit is supported. (Classifications are: impermissible ordinary, ordinary projection, first class, first class projection and concrete-cradle bedding.)
- Plane** (of rock)—Refers to the plane of junction between different beds or layers of rock.

- Bedford Limestone**—A light-colored oolitic limestone from Bedford, Indiana. Much used as a building stone.
- Bedrock**—The solid rock underlying auriferous gravel, sand, clay, etc., and upon which the alluvial gold rests. Any solid rock underlying soil, sand, clay, etc.
- Beehive Coke**—Coke manufactured in beehive rectangular, or similar forms of ovens in a horizontal bed, where heat for the coking process is secured by combustion within the oven chamber.
- Oven**—An oven for the manufacture of coke, shaped like the old-fashioned beehive. The volatile products, as tar, gas, and ammonia, are not saved.
- Beerbachite**—Small dikes associated with and penetrating large, gabbro masses, and having themselves the chemical composition and texture of gabbro.
- Beetle**—A heavy wooden mallet (maul) to drive wedges, with handle for swinging.
- A rammer, with handle set in middle of head, for tamping. A tamper.
- Bega or Beg**—A prefix meaning one billion.
- Beg Ohm**—In electricity, the resistance equal to one thousand megohms; one billion ohms.
- Bel**—In acoustics, the fundamental division of a logarithmic scale for expressing the ratio of two amounts of power, the number of bels denoting such a ratio being the logarithm to the base ten of this ratio.
- Belgian Block Pavement**—A stone block pavement the stones being rectangular in shape and of a size about 3x6x10 inches, although varying more or less, except in the matter of thickness.
- Oven**—A rectangular oven with end doors and side flues for the manufacture of coke.
- Belite**—A term given by Tornebohm to one of the constituents of Portland cement, later identified as C<sub>2</sub>S.
- Bell**—The flared end of a pipe, into which the spigot end fits.
- Metal**—A hard bronze, containing sometimes small proportions of iron, zinc, or lead, but ordinarily consisting of 78 parts copper to 22 tin.
- Bell and Hopper**—A charging device on top of a blast furnace.
- Crank**—A right angle lever pivoted at angle, for changing direction of motion, force, etc.
- Bell-and-Spigot Joint**—The usual term for the joint in ordinary cast iron pipe. Each piece is made with an enlarged diameter or bell at one end into which the plain or spigot end of another piece is inserted when laying. The joint is then made tight by cement, oakum, lead, rubber, or other suitable substance, which is driven in and calked.
- Bellite, Black**—(See black bellite.)
- Belonite**—A rod or club-shaped microscopic mineral.
- Belt Course**—In stone masonry, a projecting course of masonry immediately under the coping; a belt course is often called a corbel course.
- Belugite**—A name for the transition group of plagioclase rocks between diorites and diabases.
- Bench**—Ledge of any kind of rock that is shaped like a step or terrace.
- Flume**—A conduit on a bench cut on sloping ground.
- Mark**—In surveying, any well-defined immovable point along the course of a survey line the elevation of which is accurately established, preferably in relation to an acceptable standard datum and which may be available for future use.
- Terrace**—A shelf-like embankment of earth with a flat top and a steep

or vertical downhill face, constructed along the contour of sloping land to control run-off and erosion.

—**Wall**—A wall with a horizontal offset in it along its length.

—The wall or abutment supporting an arch. (See abutment.)

**Benched**—Formed into a series of benches.

**Benchmark**—A relatively permanent point of known or assumed elevation.

—**Slab**—A thick plate of cast metal with holes drilled in it for holding pins around which thin plates or bars may be bent to required shape.

**Bending Stress**—The stress produced in the outer fibers of a rope by bending over a sheave or drum.

—Stress in the outer fibers of a material deflected by loading.

—The stress produced in a member by a bending moment.

**Bent**—The group of members forming a single vertical support of a trestle, designated as pile bent where the principal members are piles; and as framed bent where of framed timbers.

—**Club Dolly**—A club dolly having a bend in the hammer or anvil.

—**Column**—A bent composed of columns and bracing in contra-distinction to "pile bent."

—**Grasses**—Certain varieties of grass that ordinarily lie close to the ground. Roots usually take hold from the joints.

—**Rocker**—A bent generally of steel, though sometimes of timber, hinged at either one or both ends so as to provide for the expansion and contraction of the span supported.

—**Solitary**—A single bent of a trestle that is not attached to either adjacent bent except by the girders of the deck.

—**Trestle**—In trestle construction, one of a series of bents carrying a deck.

**Bent-eye**—An eye on the end of a

bar, the plane of which makes an angle with the direction of the bar. Formerly used in bridges, but now abandoned as unscientific.

**Bentonite**—The plastic residue from the weathering of ash (volcanic); it swells enormously in water and forms a milky suspension.

**Benzine**—A colorless, inflammable and volatile liquid obtained from petroleum by fractional distillation and consisting of various hydrocarbons.

**Berlin Iron**—A soft iron, containing phosphorous, making very fine smooth castings, and used for ornaments and jewelry.

**Berm**—The space left between the top or toe of slope and excavation made for intercepting ditches or borrow pits.

—An approximately horizontal space introduced in a slope.

—Often used for word "shoulder" in road work.

—**Ditch**—A ditch or channel along or on a berm or shoulder of ground to take care of excess run-off.

**Bernoulli's Theorem** (hydraulics)—A proposition advanced by Daniel Bernoulli which states that the total energy at any cross section of a flowing stream is equal to the total energy at any other downstream cross section plus the intervening energy loss. In applying this theorem, energy is usually measured as head.

**Berth**—The water area, at the waterfront edge of a wharf reserved for a vessel.

**Bertrand Lens**—In optical mineralogy, a small lens inserted in the microscope tube to magnify the interference figure.

**Beryl**—A glaucinum-aluminum silicate. Used as a gem stone when clear and well colored. The grass-green variety is known as emerald; light green as beryl; blue-green as aquamarine.

**Bessemer Ore**—Iron ore containing little or no phosphorus, hence es-

pecially suited for use in the Bessemer process.

**Bessemer Process**—A process for making steel by the decarburization of crude pig iron by means of finely divided air current blown through the metal when in a molten state. Named for its inventor, Sir Henry Bessemer.

**Beta Brass**—A copper-zinc alloy with a copper content of approximately 54 per cent.

—**Dicalcium Silicate**—In cement technology, an important compound of Portland cement and the one chiefly responsible for the development of strength at late ages; commonly abbreviated to  $B_2CaO$ ,  $SiO_2$  or  $BC_2S$ .

**Bethell Process**—In wood preservation, the pressure treatment with creosote consisting of the following steps: Preliminary vacuum; injection of creosote; final vacuum. Now generally known as the "full cell" process.

**Betterment**—Improvement of an existing facility through the substitution of superior parts for inferior parts retired.

**Betterments, Major**—(See major betterments.)

—**Minor**—(See minor betterments.)

**Bevel**—The slope on the end of a piece; an instrument for drawing angles; used by mechanics. To slope or sharpen an edge.

—**Gear**—A gear wheel whose teeth are inclined to the axis of the wheel.

**Beveled Edge**—An edge that is made thin by beveling.

**Bickford's Safety Fuse**—A time fuse in the form of a flexible cord or cable which fits into the metal cases of the detonators used for initiating the explosion of cartridges or other masses of high explosives.

**Bid**—In engineering economics and cost keeping, to submit a contract price; the bidding price being the tender. To make a price on any-

thing; a proposition, either verbal or written, for doing work and/or supplying materials and/or equipment.

—**Guaranty**—The required security submitted with the bid to insure execution of contract and bond for the performance of the work if the bid is accepted.

—**Unbalanced**—A bid in which some of the unit prices are abnormal, either too high or too low, generally both.

**Bidder**—Any individual, firm or corporation submitting a bid for the work contemplated, acting directly or through a duly authorized representative.

**Bifurcation Gate**—A structure that divides the flow between two conduits.

**Bight**—The double part of a rope when bent; a round bend or coil not including the ends.

**Bill of Lading**—A receipt issued by the representative of a common carrier for goods accepted for transportation to a specified point and at a given rate. It is a contract, and, when transferred to a third party, becomes an absolute title to the goods.

**Bill of Material**—A list of the various portions of material for a construction, either proposed or completed, giving dimensions and weights or other quantitative measurements.

**Billet**—A bar of iron or steel of square or rectangular cross-section, approximately the size and length required for the finished article to be produced from it; a small bloom.

—**Steel**—Steel cast in billet form, either by the Bessemer or open hearth process. Does not include high carbon or rerolled steel.

**Biltmore Stick**—A graduated rule for measuring trees, usually of wood, the graduations of which indicate, when the rule is held tangentially to the tree, the diameter of the

tree at the point where measured. The rule is constructed on the principle of similar triangles.

**Binary Compound**—A compound of two components.

**Binary-granite**—Varieties of granite that are chiefly quartz and feldspar.

**Binder**—A foreign material introduced into the mineral portion of the wearing surface for the purpose of assisting the road metal to retain its integrity under stress, as well as, perhaps, to aid in its first construction.

—The course, in a sheet-asphalt pavement, frequently used between the concrete foundations and the sheet-asphalt mixture of graded sand and asphalt cement.

—**Soil**—In soil stabilization, binder soil is that material which consists primarily of fine soil particles (fine limestone, true clay and colloids) that has good binding properties. This material is commonly referred to as clay or stone dust binder.

**Binding Posts**—In electricity, the metal posts to which wires are fastened on an apparatus.

**Bio-Aeration**—A modification of the activated sludge process in which the sewage and sludge are agitated and aerated by mechanical means, such as paddle wheels or turbines.

**Bio-Chemical Action**—Chemical action resulting from the growth or metabolism of living organisms.

—**Oxygen Demand**—The quantity of oxygen required for bio-chemical oxidation in a given time under specific conditions at a given temperature, the determination usually being for 5 days at 20 degrees Centigrade.

**Bio-Flocculation**—Coalescing of minute particles resulting from the action of biological and physical agencies.

**Biolytic Tank**—A continuous flow tank with hopper bottom, with inlet

arranged so as to agitate the sludge by the entry of sewage at the apex of the hopper shaped bottom. This agitation tank is sometimes followed by a settling tank in which the sludge is detained until removed.

**Biphase**—In electricity, two phase.

**Biplane**—An airplane with two main supporting surfaces placed one above the other.

**Bipolar**—In electricity, possessing two magnetic poles; dipolar.

**Bird's Eye Marble**—A local name given to several varieties of marble in which the markings assume the appearance of a bird's eye.

**Bismuth Bronze**—An alloy of bismuth with tin.

**Bit**—A tool for boring into wood or metal.

**Bitoslag**—A trade name for plant-mixed paving material composed of crushed slag, fines and a special asphalt binder known as Bitocement.

**Bit, Expansion**—(See expansion bit.)

**Bitite**—In electricity, an insulating material.

**Bittern**—The bitter mother liquor that remains in salt works after the salt has crystallized out.

**Bit-U-crete**—This is a bituminous concrete prepared from a stable emulsion. The ingredients of the mix are weighed out and voidage reduced to a minimum. Clay or a similar mineral filler is used in making the stable emulsion.

**Bitumen Index**—A figure representing the weight of bitumen in grams used to coat one square centimeter of the superficial area of the aggregate particles in a paving mixture.

**Bitumens**—Mixtures of hydrocarbons of natural or pyrogenous origin or combinations of both frequently accompanied by their non-metallic derivatives, which may be gaseous, liquid, semi-solid, or solid, and

which are completely soluble in carbon disulfide.

**Bituminous**—Of bitumen, or containing bitumen; as asphalt macadam, or tar macadam, or tar cement, or asphalt cement.

—constituting the source of bitumen.

**Bituminous Base Course**—A road foundation consisting of mineral fragments bound together with bituminous material.

—**Binder or Leveling Course**—An intermediate course between a base course and a bituminous surface course for roads or streets. Binder course is usually a coarse graded aggregate bituminous concrete, but seldom contains mineral filler.

—**Bound**—Bonded with the aid of bituminous material.

—**Carpet Coat**—A mat of bituminous cemented mineral aggregate not more than  $\frac{3}{4}$ -inch thick resulting from the surface treatment of a road or pavement with a bituminous material and mineral aggregate cover.

—**Cement**—A bituminous material suitable for use as a binder or adhesive agent, having cementing qualities which are dependent mainly on its bituminous character.

—**Concrete**—A mixture of bituminous cement with coarse graded mineral aggregate. It is used in the construction of bituminous bases, binder courses and wearing courses. The most common mineral constituents of bituminous concrete are a combination of broken stone, broken slag or gravel with sand and mineral filler, except that the mineral filler is usually left out of base and binder course mixtures.

—**Emulsion**—A liquid mixture in which minute globules of bitumen are held in suspension in water or a watery solution.

—**Macadam**—A type of highway construction in which a broken stone aggregate of relatively coarse and

uniform size fragments is first spread and interlocked by compaction, after which the individual stones are coated and bound together with hot bituminous cement which is applied at the surface but penetrates the layer of stone before it cools. A bituminous macadam surface course is finished off with a surface treatment of bituminous cement and cover of stone chips to seal the surface. In the construction of a bituminous macadam base the seal coat is omitted.

—**Material**—Material containing bitumen as an essential constituent. **Liquid Bituminous Material**—Bituminous material showing a penetration at normal temperature under a load of 50 grams applied for 1 sec. of more than 350. **Semi-Solid Bituminous Material**—Bituminous material showing a penetration at normal temperature under a load of 100 grams applied for 5 sec. of not more than 10, and under a load of 50 grams applied for 1 sec. of not more than 350. **Solid Bituminous Material**—Bituminous material showing a penetration at normal temperature under a load of 100 grams applied for 5 sec. of not more than 10.

—**Pavements**—Highway and similar structures in which the mineral aggregate for a depth of over  $\frac{3}{4}$ -inch from the surface is coated and cemented together with bituminous cement. The foundation or base of the bituminous pavement may be of any type of construction such as soil, gravel, macadam, telford, Portland cement concrete, bituminous macadam and bituminous concrete, or an old brick or block pavement may be utilized as a foundation.

—**Prime Coat**—An initial application of a low viscosity liquid bituminous material to an absorbent highway surface preparatory to the construction of a carpet coat, surface

course or base. The object of priming is to penetrate the existing surface so as to plug capillary voids, to coat and bond dust and loose mineral particles and thus harden or toughen the surface and promote adhesion between it and any superimposed treatment or construction.

—**Primer**—A liquid bituminous road material of low viscosity which upon application to a non-bituminous surface is completely absorbed. Its purpose is to waterproof the existing surface and prepare it to serve as a base for the construction of a bituminous carpet or surface course.

—**Seal Coat**—A thin bituminous carpet coat seldom over  $\frac{1}{2}$ -inch thick.

—**Surface Course**—The top course of a bituminous pavement. It may be fine aggregate type, graded aggregate type, or coarse aggregate type.

—**Surface Treatments**—Applications of bituminous materials to any type of road or pavement surface, with or without a cover of mineral aggregate, which do not produce an increase in thickness of more than  $\frac{3}{4}$ -inch.

—**Tack Coat**—A term describing the initial application of bituminous material to a previously primed surface or to an existing pavement to insure thorough bond between new construction and the old road surface.

**Bituminized Cement**—A product produced by the addition of small amounts of bituminous material (from 2 to 6 per cent) to the ordinary Portland cements. Special compressed air methods are used for the thorough mixing of the two materials.

**Bituroc**—This type paving generally falls in the high type construction. It is mined from natural Kentucky silica sandstone deposits containing varying amounts of bitumen from 0 to 12 per cent. It is quar-

ried and crushed to fineness of said grains and the bitumen content controlled to about 7 to 9 per cent by mixing leaner and richer sandstone mixtures as needed.

**Bitusprink**—A chemically treated liquid asphalt or tar compound containing not less than 50 per cent bitumen, which will mix with a chemically treated hard water in any proportion without noticeable separation, breaking or clotting. It is used as a dust preventive.

**Black Bellite**—An explosive mixture containing 61 per cent ammonium nitrate, 12 per cent trinitrotoluene, 24 per cent sodium chloride, and 3 per cent plumbago.

—**Horse**—Term used by quarrymen to denote a dark biotite gneiss in contact with the granite.

**Blackband**—The black, bituminous carbonate of iron, forming beds in sedimentary series containing coal seams. The mineralogical name is siderite.

—**Body**—If, for all values of the wave length of the incident radiant energy, all of the energy is absorbed, the body is called a black body.

—**Diamond**—A variety of diamond, opaque, dark colored, and without cleavage.

**Blackjack**—A dark variety of zincblende or sulphide of zinc. It has a resinous luster and yields a light colored streak or powder. The mineralogical name is sphalerite.

**Blade Angle**—The acute angle between the chord of a section of a propeller, or of a rotary wing system, and a plane perpendicular to the axis of rotation.

—**Back**—The side of a propeller blade that corresponds to the upper surface of an airfoil.

—**Element**—A portion of a propeller blade contained between the surfaces of two cylinders coaxial with the propeller cutting the propeller blades.

- Face**—The surface of a propeller blade that corresponds to the lower surface of an airfoil. Sometimes called "thrust face" or "driving face."
- Section**—A cross section of a propeller blade made at any point by a plane parallel to the axis of rotation of the propeller and tangent at the centroid of the section to an arc drawn with the axis of rotation as its center.
- Blade-Width Ratio**—The ratio of the chord of a propeller blade section to the diameter of the propeller.
- Mean**—The ratio of the mean blade width to the diameter of the propeller.
- Blake Crusher**—The original crusher of jaw type. A crusher with one fixed jaw plate and one pivoted at the top so as to give the greatest movement on the smallest lump.
- Blanched Copper**—An alloy of copper and arsenic.
- Blast Furnace**—A furnace in which combustion is forced by a current of air under pressure, especially for smelting ores. A blast furnace is designated as hot-blast or cold-blast according to the temperature of the air used for the blast. The furnace is usually vertical, but varies greatly in size and shape.
- Furnace Slag**—Non-metallic product, consisting essentially of silicates and alumino-silicates of lime, which is developed simultaneously with iron in a blast furnace.
- Blast Gate (supercharger)**—A device for controlling the pressure in the nozzle box of a turbosupercharger by discharging into the free atmosphere a portion of the exhaust gases that would otherwise pass through the turbine wheel.
- Blasting Cap**—A copper shell closed at one end and containing a charge of detonating compound, which is ignited from the spark of the fuse. Used for detonating high explosives.
- Fuse**—A slow burning fuse used for igniting blasting charges.
- Powder**—A powder containing less nitrate, and in its place more charcoal than black powder. Its composition is 65 to 75 per cent potassium nitrate, 10 to 15 per cent sulphur and 15 to 20 per cent charcoal.
- Bleaching Clay**—Kaolin used with size, to whiten and give weight and substance to cotton goods.
- Powder**—Calcium chloride hypochlorite used as a disinfecting or sterilizing agent for sewage and as a deodorant for sludge.
- Bleeding**—The exudation of bituminous material on the roadway surface after construction.
- In wood preservation, the exuding of preservative from the treated timber.
- Blimp**—A colloquial term for a non-rigid airship.
- Blind Drain**—A trench filled with broken stone.
- Flying**—(See instrument flying.)
- Header**—In stone masonry, a header that extends only a short distance back into a wall instead of extending to the full depth specified.
- Roaster**—A muffle furnace.
- Seams**—Quarrymen's term for incipient joints.
- Blinker Light**—A flashing light giving more than 20 flashes per minute.
- Blister**—To raise filmy vesicles on a surface by heat. A small raised portion of a surface with a void beneath.
- (aeronautic) A sheet of clear water raised by the motion of a float or hull and separated from the free-water surface by an air space.
- Block**—In soil conservation, a small dam or obstruction in a contour furrow to prevent flow along the furrow.
- A grooved pulley, rotating on a pintle and mounted in a casing called a shell, which is furnished

with a hook, eye, or strap by which it may be attached to an object. Used for moving heavy weights. Blocks are of various forms, each having a particular name: Single or double block, differential block, fall-block, purchase-block, snatch-block, standing block, tail-block.

—**Batting**—(See batting block.)

—**Bond**—A style of bricklaying in which the bricks are laid cross-wise and lengthwise alternately.

—**Coal**—A peculiar kind of coal that breaks into large cubical blocks. It is used raw, or without coking in the smelting of iron.

—**Fuse**—(See fuse block.)

—**Mountains**—In geology, ridges due to faulting. Ordinarily one slope is gentle and the other is steep.

—**Overthrusts**—In structural geology, large masses displaced by certain tangential pressures over inclined or horizontal planes.

—**Rubble**—Large blocks of building stone as they come from the quarry.

—**Tin**—Commercial tin, cast into blocks, and partly refined. Solid tin as distinguished from tin plate. Also called bar tin.

**Block and Tackle**—A term including the block and the rope rove through it for hoisting or obtaining a purchase.

**Bloom**—In steel manufacture, a roughly prepared mass of iron or steel nearly square in section and comparatively short in proportion to its thickness.

—An intermediate product resulting from the rolling of an ingot. In rail making it is usually about 8 inches square, but may be rectangular in cross-section.

—**Reheating**—The heating of blooms, after leaving the bloom shears, in a furnace to secure proper temperatures for rolling.

**Bloomated**—Made into blooms.

**Blooming Mill**—The first set of rolls in a rolling mill.

—**Rolls**—Rolls in which puddle balls

of iron or steel are squeezed into blooms.

**Blow**—The period during which air is forced through the molten metal in the Bessemer process, or the action itself, or the steel produced from one charge.

—That portion of the time occupied by a certain stage of metallurgical process in which the blast is used. To explode.

—In caisson work the term "blow" refers to the letting of air out of the working chamber so that the caisson may drop.

—**Down**—The act of letting water out of the boiler for the purpose of carrying out sediment to reduce the concentration of dissolved solids or for both purposes.

—**Hole**—A defect in iron or steel caused by the escape of gas or air while solidifying.

—**Soil**—Soil that has been moved by the wind.

**Blow-in**—To put a blast furnace in operation.

**Blown Asphalt**—(See oxidized asphalt.)

—**Petroleums**—Semi-solid or solid products produced primarily by the action of air upon liquid native bitumens which are heated during the blowing process.

**Blow-off** (hydraulics)—A controlled outlet on a pipe-line used to discharge water or detritus.

**Blow-out**—In soil conservation, the depressed area from which soil has been removed by wind erosion.

**Blue Printing**—A method of photo-printing by using paper sensitized with ferropotassium ferricyanide.

**Blue-ground**—Name for the decomposed peridotite or kimberlite which carries the diamonds in the South African mines.

**Blue-shortness**—A condition of brittleness in wrought iron caused by its having been worked at a blue heat.

- Board Measure**—The standard measure for timber, the unit being one foot square and one inch thick. Feet board measure of finished lumber is usually a fraction of an inch less in width and thickness.
- Boasting Chisel**—A flat chisel with an edge 2 inches wide, used in dressing stone.
- Boat, Flying**—(See flying boat.)
- Boatswain's Chair**—A seat formed in a rope by placing a piece of board in the bight of the rope. Used for painting and working at places difficult of access.
- Bobbin**—In electricity, the exciting coil for an electromagnet.
- Body, Black**—(See black body.)
- Bog**—Soft, spongy ground, usually wet and composed of more or less vegetable matter.
- Earth**—A soil composed for the most part of the fine siliceous matter and partially decomposed vegetable fiber.
- Iron Ore**—A spongy variety of hydrated oxide of iron or limonite. Found in layers and lumps on level sandy soils which have been covered with swamp or bog.
- Bogue**—A mouth; an embouchure; used specifically in the name of Bogue, the principal mouth of the Canton River, also called Boca Tigris. (See Embogue.) The term applies to mouth or outlet of a river and derives from French or Spanish origin. Does not seem to be used west of the Mississippi River, but is used east of the Mississippi River; i. e., Bogue Phalia and Bogue Hasty and a few other streams in Alabama and Mississippi.
- Boiler Compound**—A combination of chemicals applied to the feed water for the improvement of boiler water conditions.
- Boiling Point**—The temperature at which a liquid begins to boil, or to be converted into vapor by bubbles forming within its mass. It varies with the pressure. In water, under ordinary conditions it is 212 degrees F. or 100 degrees C.
- Bollard**—Metal post secured to a wharf or pier and used to moor vessels by means of lines extending from the vessel and fastened to the post.
- Bolster**—A casting supporting the fixed end of truss or girder.
- Bolt**—A cylindrical jet, as that of water.  
—A metallic pin or rod having a head at one end and a thread on the other for screwing up a nut.
- Anchor**—A round steel bolt embedded in concrete or masonry to hold down machinery, castings, spans, shoes, engine beds, etc.
- Assembling**—A threaded bolt for holding together temporarily the several parts of a structure during riveting.
- Barb**—A bolt having jagged edges so as to prevent its being withdrawn from the object into which it is driven.
- Blank**—A bolt having a fixed head, but no threads or nuts.
- Clinch**—A bolt with one of its ends designed to be bent over to prevent withdrawal.
- Construction**—A common steel bolt used temporarily during construction; such as a bolt to hold forms together.
- Countersunk**—A bolt having its head beveled and flattened, so that when put into place the said head will not project from the surface.
- Drift**—A short rod or square bar driven into holes bored in timber for attaching adjacent sticks to each other or to piles. The length generally varies from one foot to two feet.
- Expansion**—A bolt which may be expanded or enlarged after placing.
- Eye**—A bolt having a loop or eye at one end in place of the customary flat head.

- Fitting-up**—An ordinary bolt used to hold steel members together while the same are being riveted.
- Hook**—A bolt having one end in the form of a hook.
- Lewis**—A wedge-shaped ended bolt inserted like the shank of a Lewis in a hole drilled in a stone and fastened therein by pouring melted lead into the unoccupied part of the hole.
- Lug**—A round bolt to which is welded a flat iron bar.
- Machine**—A threaded bolt having a straight shank and a square or hexagonal shaped head.
- Oil**—A viscous neutral oil having a gravity of 30° Baume, and a Saybolt viscosity of 220. Used in cutting nut and bolt threads.
- Skinned**—A bolt from which the threads have been stripped.
- Stud**—A bolt threaded at both ends.
- Swedge**—A bolt with a deformed shank.
- Tap**—A bolt which is screwed into the material which it holds instead of being screwed by a nut.
- Through**—A bolt which passes from side to side of the members which it fastens.
- Tie**—A round bolt with a square shank and lip for hooking ties to the flanges of stringers.
- Toggle**—A bolt connecting the parts of a toggle.
- Turned**—A machine bolt, ordinarily with hexagonal head, turned down so that when put in place it has a driving fit.
- U**—A rod bent in the shape of the letter "U" with threads and nuts on the ends.
- Bombs**—Masses of lava expelled from a volcano by explosions of steam. They fall as rounded masses.
- Bonanza**—In mining geology, a body of rich ore.
- Bond**—A bond is a certificate held by a person who has lent money to a corporation. A bond thus obtained is a promise to pay the money back with interest at a specified time and usually in a specified way.
- The combined action of inertia, friction, and of the forces of adhesion and cohesion which helps the separate particles composing a crust or pavement to resist separation under stress. Mechanical bond is the bond produced almost wholly, in well-built broken-stone macadam road, by the interlocking of angular fragments of stone and the subsequent filling of the remaining interstices with the finer particles.
- In stone or brick masonry, the mechanical disposition of stone, brick or other building blocks by overlapping to break joints.
- (Reinforced concrete) Adhesion between concrete and reinforcing steel.
- A promissory note secured by the assets of an enterprise.
- Block**—(See block bond.)
- Called**—(See called bond.)
- Collateral**—(See collateral bond.)
- Consolidated**—(See consolidated bond.)
- Convertible**—(See convertible bond.)
- Diagonal** (concrete work)—(See diagonal bond.)
- Direct** (concrete work)—(See direct bond.)
- Divisional**—(See divisional bond.)
- Extended**—(See extended bond.)
- First Mortgage**—(See first mortgage bond.)
- Flemish**—(See Flemish bond.)
- General Mortgage**—(See general mortgage bond.)
- Gold**—(See gold bond.)
- Guaranteed**—(See guaranteed bond.)
- Mechanical**—The bond produced almost wholly, in a well-built broken stone macadam road, by the interlocking of angular fragments of stone and the subsequent

- filling of the interstices with the finer particles.
- Participating**—(See participating bond.)
  - Performance**—(See performance bond.)
  - Prior Lien**—(See prior lien bond.)
  - Refunding**—(See refunding bond.)
  - Serial**—(See serial bond.)
  - Bonder**—In masonry, a stone or brick extending through a wall and binding it together; a binding-stone.
  - Bone Coal**—Slaty or argillaceous coal, or carbonaceous shale occurring in coal seams.
  - Boom**—A long beam or spar projecting from near the foot of a derrick or hinge casting of a power crane or shovel, and sustaining the load that is raised from its outer end.
  - Derrick**—The long member in a derrick which supports the load at its outer end.
  - Brace**—A tackle extending from the end of the boom to the top of the mast in a derrick. The trussing placed below or at the sides of the boom to strengthen it.
  - Guy**—A line, cable, or adjustable rod fastened to the middle of a derrick boom and extending to the bull-wheel to which it is attached so as to act as a brace.
  - Iron**—A circular iron ring on the end of a mast of a derrick.
  - Tail**—(See tail boom.)
  - Boom-out**—The position of the boom at its greatest reach.
  - Boom-seat**—The place in a derrick where the boom and the mast meet and rest on the sill.
  - Boost**—To supply an engine with more air or mixture than it would normally induct at sea level.
  - Control, Automatic**—An automatic regulator of boost pressure.
  - Booster**—A small amount of high explosive attached to a detonator for the purpose of increasing the rate of detonating of a charge.
  - Booster Fan**—An additional fan placed at some point in a mine to assist in the ventilation.
  - Magneto**—(See magneto, booster.)
  - Border**—An earth ridge thrown up to hold irrigation water within prescribed limits in a field.
  - Border Irrigation**—In soil conservation, an open field method of flood irrigation between controlling ridges or borders.
  - Strip**—In soil conservation, grassed or thickly vegetated strip at edge of field, along outlet channels or at end of rows to check or prevent erosion.
  - Borebit**—A rock-boring chisel.
  - Bore-hole**—A hole drilled into the ground for sampling or mineral production.
  - Borer, Increment**—In wood preservation an auger with a hollow shaft used in removing a small core from wood for examination. Convenient for determining the depth of penetration in treated timber.
  - Borers** (marine)—Small marine animals which have their homes in burrows or galleries which they excavate in wood submerged in sea water; principally *Teredo*, *Bankia*, *Linnoria* and *Sphaeroma*. Ship worms.
  - Machine, Chord**—A boring machine used in bridge shops for boring pin-holes in chords.
  - Boring Bar**—A revolving or stationary bar carrying one or more cutters or drills for boring.
  - Head**—The cutting end of a boring tool, especially the cutter head of a diamond drill.
  - Machine**—A mechanical device for drilling holes.
  - Mill**—A large machine tool having a horizontal revolving table to which the object to be trimmed is fastened and in which the cutting tool, except for feed adjustment, remains fixed in position while the object revolves. Used for turning

large castings and boring large holes.

—**Rod**—A rod made up of segments, carrying at its lower end a tool for earth boring or rock drilling.

**Bornite**—A sulphide of iron,  $\text{Cu}_3\text{FeS}_3$ , and containing about 28 per cent sulphur, 56 per cent copper, and 16 per cent iron. A valuable ore of copper.

**Borrow** (noun)—All material used in making embankments, which does not come from necessary excavation.

—**Pit**—An excavation made for the purpose of obtaining embankment material.

**Borsella**—An instrument for stretching or contracting glass in its manufacture.

**Bort**—Black diamond used for cutting edges.

—Rounded forms of the diamond, usually with a rough exterior, and no distinct cleavage.

**Boss**—In geology, an intrusive mass of rock with a rounded, elliptical or irregular outcrop.

**Bostonite**—Certain dikes, having practically the composition of trachytes or porphyries.

**Bottom Contraction** (hydraulics)—That contraction of the nappe, or jet, of water passing over a weir brought about by detachment of the lower surface of the nappe from the wier crest.

**Boulder Quarry**—One in which the joints are either so close or so irregular that no very large blocks of stone can be quarried.

**Boulders**—Detrital material greater than 200 mm. or about 8 in. in diameter.

**Boulton Process**—In wood preservation, a process for removing moisture from wood by boiling it in creosote under a vacuum.

**Bound**—Bonded.

**Boundary**—A line between areas of the earth's surface occupied by rocks or formations of different

type and age; especially used in connection with geologic mapping, hence also a line between two formations or cartographic units on a geologic map; that which indicates or fixes a limit or extent or marks a bound, as of territory.

—**Layer**—A layer of fluid, close to the surface of a body placed in a moving stream, in which the impact pressure is reduced as a result of the viscosity of the fluid.

—**Light**—Any one of the lights designed to indicate the limits of the landing area of an airport or landing field.

**Boundry Curve**—A curve used in a phase diagram to indicate the separation of different primary phases.

**Bow Cap**—(1) A cap of metal or fabric used to reinforce the extreme forward end of a bow stiffener of a nonrigid or semi-rigid airship. (2) The conical or cap-shaped structure at the extreme bow of a rigid airship to which the longitudinal girders are attached and which supports the bow mooring spindle.

**Bowheavy**—The condition in which, in normal flight, the forward end of an airship tends to sink, and which requires correction by means of the horizontal controls. It may be due to either aerodynamic or static conditions, or to both (cf. sternheavy).

**Boulder-Belt**—A belt of glacial boulders of many kinds, derived from distant sources and lying transverse to the direction of glacial movement.

**Bowlder Clay**—The stiff, hard, and usually unstratified clay of the drift or glacial period which contains bowlders scattered through it; also called Till, Hardpan, Drift clay.

**Bow-Weighing Device**—An instrument for measuring the horizontal and vertical forces between an airship and its mooring mast (cf. stern-weighing device).

- Box Bridge**—In electricity, a modified form of wheatstone bridge for the measurement of resistance.
- Canyon**—A canyon, from the bottom of which four almost vertical walls appear on all four sides, as a result of the canyon's zigzag course.
- Culvert**—A small culvert with an opening of rectangular shape.
- Girder**—Any built-up girder of rectangular section. Frequently used for the rectangular longitudinal members in the keel of a rigid airship from which the fuel tanks and gas cells are suspended.
- Metal**—A brass, bronze, or anti-friction alloy used for the journal boxes of axles or shafting.
- Strut**—Any strut built of structural shapes having a box-like cross-section.
- B. R.**—Letters used in roadside planting specifications to denote trees or plants that have their roots bare.
- Brace**—Generally a strut in compression supporting or fixing in position another member. Sometimes the term is applied to a tie for such a purpose.
- Panel**—A section of a fence in which a brace or tie, or both, are introduced.
- Braced**—Strengthened or well inter-laced and linked together by bracing.
- Bracer**—A brace.
- Bracing**—The timber used to support the sides of a trench.
- A system of braces, as in lateral systems.
- Any member intended to stiffen or strengthen a structure, but not to take direct stress.
- Bottom Lateral**—Lateral bracing in the plane of the bottom chords of a truss.
- Frame**—A frame of steel or timber built in a manner to withstand distortion.
- Ladder**—Bracing consisting of struts only.
- Lateral**—A system of tension or compression members, or both, forming the web of a horizontal truss connecting the homologous chords of the opposite trusses of a span.
- Longitudinal**—Bracing extending lengthwise of the structure, or parallel to its center line.
- Overhead**—The upper lateral or the vertical sway bracing in through bridges.
- Portal**—The combination of struts and ties in the plane of the end posts at a portal which helps to transfer the wind pressure from the upper lateral system to the pier or abutment.
- Side**—The bracing of the sides of falsework, of a timber trestle, or of a pony-truss bridge.
- Stringer**—Diagonal bracing in the plane of the upper flanges of the stringers.
- Vertical**—Wind bracing lying in a vertical plane, such as sway bracing.
- Bracket**—A knee or knee brace, connecting a post or batter to an overhead strut.
- Crab**—A hoisting apparatus fastened to a wall.
- Brake**—The whole combination of parts by which the motion of a car or machine is arrested or retarded. It almost always works through friction and may be mechanical (band or shoe brake), electrical (magnetic brake), or pneumatic (air brake).
- Horsepower**—Is the actual mechanical power delivered by the flywheel or pulley to the belt.
- Shoe**—A block of wood or metal formed to fit the tread of a car-wheel.
- Branch Fuse**—In electricity, the safety fuses protecting a branch circuit.
- Sewer**—(See sub-main.)
- Branches**—A heating term referring

to the pipes connecting the mains with the base of risers.

—Special forms of pipe for making connections to a sewer.

**Brass, Alpha or Beta**—(See Alpha or Beta brass.)

—**Powder**—A pulverized mixture of copper filings and ocher. Pulverized brass filings.

**Brazier**—An artificer who works in brass.

**Brazing**—The amalgamation in the molten state of soft brass with the surface of metals of a higher melting point. It is a hard soldering process and is sometimes used to build up a surface layer of brass or to join separate ferrous and/or non-ferrous base metal parts.

**Break** (of emulsion)—A separation of the phases composing the suspension or colloidal system.

—A breach.

—(in a graph) A change of slope.

—**Floor**—(See floor break.)

—**Joint**—So to overlap units that the ends will not be in line.

**Breakdown Voltage**—In electricity, voltage which punctures the insulating materials.

**Breaker**—In anthracite mining, the structure in which the coal is broken, sized and cleaned for market.

—In electricity, any device that automatically breaks an electric current.

—**Contact** (electricity)—(See contact breaker.)

**Breaking Strength** (wire rope)—The force or pull required to sever the strands of a rope if it has no other stresses on it such as bending, crushing, etc.

—**Stress**—The stress developed in a member at the point of rupture.

—**Wall**—The face of an abutment between the bridge seat and the footing.

**Breakwater**—A structure or contrivance, as a mole, mound, or wall, serving to break the force of waves and protect a harbor or anything

exposed to the force of the waves.

**Breast Line**—A mooring rope placed diagonally to prevent movement of a boat alongside a dock.

—The rope used to connect the pontoons of a floating bridge.

—**Wall**—A wall built against the face of an excavation to prevent its caving down; also called a face wall.

**Breast-board**—The weighted board or sled used in rope walks to keep the yarns taut while being twisted into a strand.

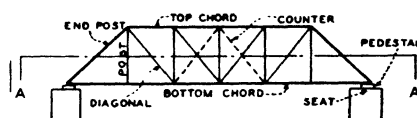
**Breathing**—The passage of air into or out of an aerostat, due to changing volume.

**Breccia**—Is a deposit containing a large proportion of coarse angular rock fragments.

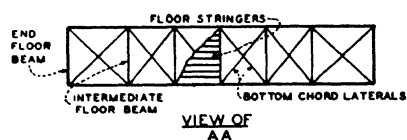
—**Tuff**—(See tuff breccia.)

**Breeze Oven**—An oven for the manufacture of small coke. A furnace designed to consume breeze or coal dust.

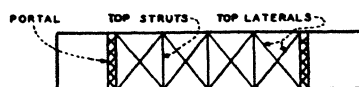
**Brewster's Law**—The tangent of the polarizing angle for a substance is equal to the index of refraction. The polarizing angle is that angle of incidence for which the reflected polarized ray is at right angles to the refracted ray.



SIDE VIEW



VIEW OF  
AA



TOP VIEW

*Bridge nomenclature*

**Brick, Slag-lime** — (See slag-lime brick.)

**Brick**—(standard paving types, and sizes) Following are the recognized types and varieties most recently approved by the Committee on Simplification of Vitrified Paving Brick of the U. S. Department of Commerce:

Name	Depth, Width, Length,		
	In.	In.	In.
Repressed lug .....	4	3½	8½
Vertical fiber lug .....	2½	4	8½
Vertical fiber lug .....	3	4	8½
Vertical fiber lug .....	3½	4	8½

—(See paving brick.)

—A building and paving material made from moist fire clay, semi-fire clay, or shale, or combinations thereof, cut or moulded into blocks and hardened by burning.

**LUG BRICK**—Brick with side or end irregularities produced by cutting or repressing, to produce separation when laid.

**PAVERS**—Brick made for paving purposes.

**RERESSED BRICK**—Cut and then repressed, with or without lugs.

**VERTICAL FIBER BRICK**—Brick laid with wire-cut side up.

**WIRE-CUT BRICK**—Cut by wire and not repressed. May be cut with or without lugs.

—**Ax**—A two-edged ax used for cutting off bricks.

—**Fire**—(See fire brick.)

—**Flashed**—(See flashed brick.)

—**Flemish**—(See Flemish brick.)

—**Furring**—(See furring brick.)

—**Insulating**—(See insulating brick.)

—**Pavement**—One having a wearing course of paving bricks or blocks.

fic over a stream or gully, including the paving material or wearing course resting directly on the floor of the structure. A structure measuring 10 ft. or more in clear span as distinguished from a culvert, which is less than 10 ft. in clear span.

—**Arch**—A curved structure carrying a roadbed over an intervening space, which produces reactions inclined to the vertical.



*Deck truss bridge*

—**Bascule**—A bridge having a span that opens by rotating in a vertical plane.

—**Box**—(See box bridge.)

—**Cantilever**—A structure at least one portion of which projects beyond the supporting pier.

—**Chain**—A suspension bridge in which chains are employed instead of the usual cables.

—**Combination**—A bridge constructed of timbers and steel or iron.

—Sometimes used to designate a bridge that carries both rail and motor vehicle traffic.

—**Deck**—A bridge in which the passing loads are carried directly to the upper chords or to the upper portions of the posts.

—**Double Rotating Cantilever Draw**—(See double rotating cantilever draw.)

—**Draw**—A bridge that may be drawn or turned to one side or lifted up, either bodily or in sec-



*Deck arch bridge with bascule span*

**Bridge**—A structure for carrying traf-

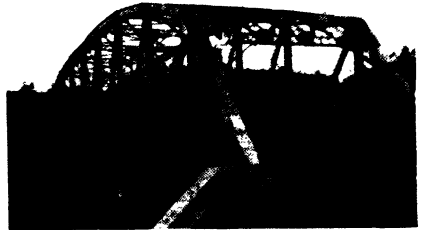
tions, so as to permit boats to pass under or through it.

- Fixed**—One that does not move except for expansion and contraction.
- Foot**—A bridge for foot passengers only.
- Frame**—A bridge constructed of sticks of timber framed together.
- Girder**—A bridge composed of plates or lattice girders.
- Hinge Lift**—A lift bridge which has its ends hinged together when down.
- I-Beam**—A small bridge consisting of a floor supported on I-beams.
- Jack-Knife**—A bridge in which the lifting arms fold on themselves at midlength when in a raised position.
- Lattice**—A bridge having riveted trusses with multiple intersections web systems.
- Leaf**—A form of draw bridge in which the rising leaf, or leaves, swing vertically on hinges.
- Leg**—A bridge resting on legs, formed by a downward extension of the end posts, instead of masonry abutments.
- Lift**—A type of movable bridge which travels in a vertical plane, sometimes called a hoist bridge.
- Pile**—A bridge consisting of pile bents and timber caps, stringers and bracing.



*I-bar suspension bridge*

- Pontoon**—A platform or roadway supported on pontoons or barges. A floating bridge.
- Pull-back Draw**—A movable span which retreats longitudinally to allow the passage of vessels.
- Revolving Draw**—A draw bridge which turns in a horizontal plane.
- Rolling Lift**—A bascule bridge in which the moving arm rolls on a plane or upon friction rollers.
- Seat**—That part of the top of a bridge pier or abutment that receives directly the pedestals or shoes of the superstructure.



*Through truss steel bridge*

- Skew**—A bridge in which the horizontal lines joining corresponding end-pins of the opposite trusses are oblique to the planes of the said trusses. A bridge in which the center line and abutment faces, posts and piers are at an angle with the channel.
- Slab**—A bridge with a cement concrete slab superstructure resting directly on the substructure.
- Stone**—A bridge built of stones laid in mortar.
- Suspension**—A roadway hung by suspenders from chain, eyebars, or cables which pass over towers of masonry or steel. The chain, eyebars, or cables are anchored at their ends in an anchorage.
- Suspension, Stiffened**—(See stiffened suspension bridge.)
- Swing**—A span that rotates about a vertical axis, so as to provide openings for the passage of vessels.
- Through**—A bridge with overhead

- bracing and carrying its floor near the elevation of the bottom chords.
- Tie**—A transverse timber resting on the stringers of a bridge and supporting the railroad rails.
- Trestle**—A bridge composed of bents or towers carrying the deck. May be of either timber or metal.
- Tubular Arch**—A bridge in which the primary supporting members are arched tubes.
- Tubular**—A plate-girder structure covered with metal construction on top and bottom, forming a boxed space through which the traffic passes.
- Wire**—The fine platinum wire which is heated by the passage of an electric current to ignite the priming charge of an electric blasting cap, an electric squib or similar devices.
- Bridging**—A piece of wood placed between and attached to two beams, or other pieces, in order to prevent them from approaching each other.
- Bridle**—A rope anchored at both ends for carrying the pull from another rope at any point between the anchors.
- Bridle**—(a) A sling of cordage or cable which has its ends fixed at two different points, to the bight of which a single line may be attached, either movable or fixed, thus distributing the pull of the single line to two points or more in the case of a multiple bridle. (b) A towing or mooring line having two legs and intended to reduce yawing when towing or mooring.
- Briggs' Standard**—A list of pipe sizes, thicknesses, threads, etc., compiled by Robert Briggs about 1862 and subsequently adopted as a standard.
- Bright Rope**—Wire rope that is not tinned or galvanized.
- Brightness**—In lighting, may be expressed in foot-lamberts. A foot lambert is a unit of brightness equal to the average brightness of any surface emitting or reflecting light at the rate of one lumen per square foot. The average brightness of any reflecting surface in foot-lamberts is therefore the product of the illumination in foot-candles by the reflection factor of the surface.
- Brine**—Water strongly impregnated with salt.
- Brinell Hardness Number**—A direct index of the hardness of metals determined by the diameter of the indentation made by a standard steel ball of known hardness under definite load. Standard Brinell tests for steel are made in a Brinell testing machine with a ball of 8 mm. diameter under 3,000 kg. load.
- Briquet**—Fuel consisting of slack or coke breeze, with usually some binding material, and pressed into lump form; also called Coalette, Egette.
- In cement testing, a specified form and shape of cement-sand block having a cross-section area at the throat of one square inch. Used in tension testing.
- British Plate**—Albata, an alloy of nickel, copper, and zinc.
- Thermal Unit**—The 1/180 quantity of heat required to raise the temperature of one pound of water from 32 deg. to 212 deg. F. at constant pressure of one atmosphere; substantially equal to that required to raise the temperature of one pound of water from 63 to 64 deg. F. Abbreviated as b.t.u.
- Brittleness**—Relative inability to resist impact or deformation without fracture.
- Brittle Zone**—In nickel steel testing, the stage between certain inferior and superior limits for percentage of nickel in the alloy where the metal is brittle, and both below and above which it is not.
- Broad Irrigation**—The disposal of sewage by application to farm land involving the incidental benefit to crops growing out of the

irrigation and fertilization resulting from the application of the sewage. (Differs from sewage farming in that the primary purpose is the disposal of sewage, while the raising of crops is incidental only.)

**Broad-Base Terrace**—In soil conservation, a long ridge of earth 10 to 30 inches high, and 15 to 30 feet wide with gently sloping sides, a rounded crown, and a broad shallow channel along the upper side, constructed to control erosion by diverting run-off along the contour at low velocity instead of permitting it to rush down the slope. Broad-base terraces may be level or have a slight fall toward one or both ends.

**Broad-Crested Weir**—In hydraulics, an overflow structure on which the nappe is supported for an appreciable distance along the stream axis; a weir on which the nappe does not become detached from the crest; i. e., no bottom contraction occurs.

**Brob**—A heavy spike, driven alongside the end of an abutting timber to prevent its slipping.

**Broccatello**—An Italian word for a brecciated and/or variegated marble.

**Broken Ashlar**—Ashlar in which the stones are rectangular, but of different sizes and shapes.

—**Base**—Any break in the base of a railroad rail.

—**Coursed**—(See broken ranged masonry.)

—**Range Masonry**—Masonry in which the bed joints are parallel but not continuous. Broken coursed.

—**Slag**—Synonymous with crushed slag.

**Bronze**—An alloy of copper and tin.

—**Steel**—An alloy of copper, tin, and iron; used as gun metal.

**Bronzite**—A word used as a prefix to the names of rocks containing the mineral.

**Broom Drag**—A road surface

smoothing tool, towed by truck or other means, having wood fiber brooms in the plane of the dragging surface.

**Brownstone**—A dark-brown sandstone from quarries in the Triassic, especially from the Connecticut River valley. Used as a building stone.

**Brunton**—A small pocket compass with sights and a reflector attached, widely used in geological surveying, sketching mine workings, or in preliminary surveys.

**Brush**—Trees less than 4-inch stump diameter, shrubs or branches of trees that have been cut off.

—**Cover**—Small trees or bushes strewn or placed over seeded areas; small trees or brush growing on an area.

—**Dam**—A check dam made of brush usually held in place with stakes and wire.

—**Hook**—A short heavy hook with an axe handle, used by surveyors for cutting brush.

—**Matting**—A matting of branches placed on badly eroded land to conserve moisture and reduce erosion while trees or other vegetative cover is being established.

—**Mattress**—Any live wood growth (preferably willow), main stem 1 inch to 3 inches diameter at butt.

—**Paving**—A term used in soil erosion and roadside development to refer to the paving of ditches with layers of brush wired down tightly over layers of straw or other materials to conform to the ditch cross section.

—**Paving**—Brush or small trees laid in a stream or watercourse over which water is to flow to prevent scour and erosion.

**B.T.U.**—(See British thermal unit.)

**Buchite**—Sandstones in which the argillaceous or calcareous cement has been melted with the quartz grains into a glass by the contact influence of neighboring basalt.

**Buchonite**—Nephelite-tephrite that contains hornblende.

**Buck**—To resist. To afford resistance. To press against a rivet-head with a dolly during driving.

**Bucker-up**—One who holds a dolly-bar on the head of a rivet while it is being driven.

**Bucket**—In hydraulics, a curved surface at the top of an overflow dam designed to deflect the water horizontally; the transition curve between the overflow face and the apron of a dam; a receptacle on the rim of an impulse water wheel that receives the impact of the water from the nozzle.

**Bucket, Automatic**—A large materials handling container usually made in two or more parts and provided with mechanical means of opening and closing. It may be single-line or two-line. It is used for handling various materials such as earth or coal, and may be of the clam shell, orange-peel or drag line type.

—**Dredge**—The bucket dredge has three principal forms: clamshell, orange peel, and dipper, operated on the end of an arm, used to scrape up the bottom of the river or harbor, and to drop the spoil into a scow.

**Buckle Plates**—Flat, steel plates which are dished at regular intervals. Used for floor plates.



*Buhrstone deposit*

**Buckshot**—A tough, tenacious earthen material which, when dry, shatters into irregular shaped pieces approximately the size of buckshot or slightly larger.

—**Cinder**—Cinder from the iron blast furnace, containing grains of iron.

—Clay in the form of small balls resulting from the action of water in motion along the bottom of the waterway.

**Budget**—A statement giving recommended projects and their estimated cost to be undertaken for a definite period or a forecast of income or expenditures for a given period.

**Buffer Bar**—The heavy iron bar in a railroad car which receives the impact of other cars.

—**Strips**—In soil conservation, more or less permanent strips of variable width planted to erosion-resisting vegetation which are not a part of the rotation and may or may not be harvested.

**Buffeting**—The repeated aerodynamic forces experienced by any part of an aircraft, caused and maintained by unsteady flow arising from a disturbance set up by any other part of the aircraft (cf. flutter).

**Bug**—In electricity, a sounding device for testing armature windings, coils, etc.

**Buggy**—A small wagon used for transporting material such as rock. The carriage on which a traveling crane rests.

**Buhrstone (rock)**—A variety of quartzite which is full of long drawn out holes. Sometimes used as millstones.

**Build**—In masonry, a vertical joint.

**Building Construction**—Includes building structures, with additions or repairs thereto, intended for use for shelter protection, comfort or convenience.

—**Cradle**—A support provided for the

frame of a rigid airship or the keel of a semi-rigid airship during construction.

—**Granite**—Granite possessing the properties and characteristics required for building stone.

**Bulkhead**—In railroad use, timbers placed against the embankment side of an end trestle to retain the embankment.

—A wall closely fitting into and across a tunnel or large conduit for holding back earth or water pressures.

—A retaining wall holding the ground from sliding into a channel or water area.

—A dividing wall across the hull of a ship or boat.

—A partition or form used for shutting off a part of given space.



*Photo courtesy Bethlehem Steel Company  
Steel sheet piling bulkhead*

—**Line**—A line in a harbor defining the channelward limit of solid fills and bulkheads. Such lines are established by the Secretary of War; however, State or municipal authorities under their police powers may establish bulkhead lines shoreward of those established by Secretary of War.

**Bulking**—In materials handling, the increase in volume in fine material such as sand, resulting from the presence of moisture.

**Bullion, Base**—(See base bullion.)

**Bull Market**—When the main trend of stock and bond prices on the market is upward, it is referred to as a "bull market." The "bulls"

are the speculators who are buying heavily with the expectation that prices will continue upward.

**Bull-dog**—Calcined tap cinders from puddling furnaces.

**Bulldozer**—In fabricating steel, a machine in which angles are bent in small circular arcs by pressure between two supports.

—In grading operations, a mold-board mounted ahead of a tractor for pushing excavated material ahead of the tractor.

**Bull-Wheel Derrick**—A derrick with a bull wheel attached to the bottom of the mast in order to swing the derrick by ropes running to the hoisting engine.

**Bump**—A sudden acceleration of an aircraft caused by a region of unstable atmosphere characterized by marked local vertical components in the air currents.

**Bumper Bag**—A cushion secured to the bottom of an airship to prevent damage when in contact with the ground.

**Bumpometer**—A straight edge equipped with wheels and an electric signaling device for testing the smoothness of pavements.

**Bunchgrasses**—Grasses so-called because of their characteristic habit of forming bunches in contrast to the sod-forming grasses. Chief among these are sacaton, dropseed, feathergrass, fescue, and wheatgrass.

**Bunker Coal**—A term applied to coal consumed by ocean steamers, tugs, ferry boats, or other steam water craft.

—**Coal**—(See coal bunker.)

**Buoy**—A floating marker along a channel or to mark a spot in deep water.

**Burble**—A term designating the breakdown of the streamline flow about a body.

**Buried Soil Profile**—A buried soil recognizable by the succession of soil horizons, as where A and B horizons in normal succession over-

lie and bury an older soil profile with A, B, and C horizons all represented; often found beneath Indian mounds and other artificial fills; also where valley-bottom soils have been covered by an immature soil caused by culturally induced wash from the valley sides.

**Burnett Process**—In wood preservation, a pressure treatment of wood with a solution of zinc chloride.

**Burnish**—To polish by rubbing; applied chiefly to metals.

**Burnt Steel**—Steel that has been overheated in the making or remelting. It is coarse-grained and very brittle when either hot or cold.

**Burr**—A nut with a screw-thread. The rough projecting edge of a drilled hole in steelwork.

**Bush Hammer** (noun)—A hammer having a serrated face, as of rows of pyramidal points, for dressing stone.

—(verb) To dress stone with a hammer having a number of pyramidal cutting teeth on its striking face.

**Bushing** (bearing)—A metal cylinder which is inserted in an opening and forms a bearing as on a shaft.

—**Metal**—An alloy used for journals, bearings of shafts.

—**Pipe Fitting**—A short tube threaded inside and outside used to screw into a pipe fitting to reduce its size.

**Business District**—The territory contiguous to and including a highway when fifty per cent or more of the frontage thereon for a distance of 300 feet or more is occupied by buildings in use for business.

**Bust Hammer**—A hammer used in

riveting work, having a rivet cutter on one end of the head and a hammer on the other end.

**Buster**—A machine for cutting off the heads of rivets; also the edged tool which does the cutting.

—**Bar**—A rivet cutter on the end of a bar.

**Butt Treatment**—In wood preservation, the preservative treatment applied to the lower or butt end of posts and poles, usually by the open tank process or by brushing.

**Buttress**—A vertical piece of masonry projecting from the face of a retaining wall to strengthen it.

—A projection on the compression side of a wall, designed to resist overturning.

**Buttressed Retaining Wall**—A retaining wall with brackets or buttresses on the side opposite the pressure face uniting the upright section with the toe of the base.

**Butt Riveting**—The making of a butt-joint by using cross-plates and rivets.

**B. X.**—In electricity, flexible metal tubing containing two conductors.

**By-Product Coke**—Coke manufactured with attendant recovery of by-products, in ovens that are heated externally.

—**Oven**—A coke oven consisting of a series of long narrow chambers arranged in rows, and heated by flues in which are burned a portion of the combustible gases generated by the coking of the coal. All of the volatile products are saved and collected as ammonia, tar, and gas, etc.

**Byzantine Architecture**—A style evolved at Byzantium (Constantinople) during the fifth century A.D.\*

# C

**C-Iron**—A piece of flat iron, sharpened on one edge and bent to the shape of the letter C, used for driving into the end of a piece of timber to prevent checking and splitting.

**Cabane**—An arrangement of struts used for bracing on an aircraft.

**Cable**—A cord or rope the strands of which are composed of wire. A wire rope.

**Cable, Concentric-Lay**—A single conductor cable composed of a central core surrounded by one or more layers of helically laid wires.

—**Suspender**—A hangar cable in a suspension bridge for supporting the floor system.

—**Suspension**—One of the cables forming the support of the floor of a suspended bridge.

**Cable's Length**—The length of a ship's cable, usually about 600 feet, or one-tenth of a nautical mile.

**Cableway**—A cable suspended between towers for conveying material.

—**Slackline**—(See slackline cableway.)

—**Tubular**—(See tubular cable.)

**Cadastral Map**—A map showing the extent, ownership, value, etc., of land. In the United States, cadastral maps usually show individual tracts of land, with corners, length and bearing of boundaries, acreage, ownership, and, sometimes, cultural and drainage features. See, also, Map; Plat.

—**Surveys**—Surveys relating to land boundaries and subdivisions, made to create or to define the limitations of titles, and to determine units suitable for transfer. The term includes surveys involving retracements for the identification, and resurveys for the restoration, of property lines. (The

term Cadastral is practically obsolete; use "land survey" or "property survey.")

**Calc-schist**—Schistose rocks, rich in calcite or dolomite and forming intermediate or transitional rocks between the mica-schists and crystalline limestones.

**Cage Screen**—A cage having three sides made of parallel bars or rods, so arranged that it may be lowered into the sewage, and raised therefrom for cleaning.

**Caisson**—A water-tight box or chamber, or cylinder, constructed of wood, steel or concrete, within which submarine construction is carried on under great air pressure to keep the water out. Used also in excavating for foundations to hold out great quantities of water so the foundation or footing of a structure may be built under water.

—**Open**—A caisson open to the air and sunk by digging or dredging within the caisson.

—**Pneumatic**—A caisson surmounted by a crib or shaft into which air is pumped under pressure so as to drive out water, thus permitting workmen to enter for the purpose of excavating.

**Calamine**—A complex silicate containing silica, zinc, and water.

**Calcareous**—Composed essentially of calcium carbonate.

—**Soil**—A soil containing sufficient calcium carbonate to effervesce when tested with weak 0.1 N hydrochloric acid. In accordance with the amounts present, these soils may be designated as slightly calcareous, strongly calcareous, etc.

—**Tufa**—An open, cellular, spongy, bladed, or moss-like deposit of calcium carbonate. Usually formed as a coating on vegetation.

**Calcination**—The reduction of ore or other material to a calx or friable condition by the action of fire.

**Calcined Gypsum**—Gypsum partially dehydrated by means of heat, having the approximate chemical formula  $\text{CaSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O}$ .

**Calcite**—Composed of crystalline calcium carbonate, usually white or colorless, soft and easily cleaved.

**Calcium Hydroxide**—In cement technology, a compound formed by hydration of free lime or on hydrolysis of  $\text{C}_3\text{S}$ , the formula of which is  $\text{Ca}(\text{OH})_2$ .

—Slaked lime.

—**Sulphate**—The usual retarder used to control the set of Portland cement. This usually is in the form of gypsum,  $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ , but occasionally is added as plaster,  $\text{CaSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O}$ , or anhydrite,  $\text{CaSO}_4$ . (See gypsum.)

—**Sulphoaluminate**—In cement technology, a compound formed by the interaction of calcium sulphate and alumina compounds in solution. The continued formation of this compound due to the action of sulphate waters on cement may give rise to disintegration. The compound is commonly marked  $3\text{CaO} \cdot \text{Al}_2\text{O}_3 \cdot 3\text{CaSO}_4 \cdot 31\text{H}_2\text{O}$ .

**Calcrete**—In petrology, a term suggested for conglomerates formed by the cementation of superficial gravels by calcium carbonate.

**Caliber**—The inner diameter or bore of a tube or pipe.

**Calibrate**—To determine the caliber of, as the interior of a thermometer-tube; to determine the relative value of, as the different parts of an ordinary scale.

**Caliche**—A material found chiefly in the southwestern part of the United States. It is composed essentially of soft limestone with varying percentages of clay.

**Caliper**—An instrument with two legs, usually bent, fastened together with a hinge or spring, used for

determining the thickness or diameter of objects, distance between surfaces, etc.



*Caliche deposit*

—**Compass**—A caliper made similar to a drawing compass or dividers with curved legs for measuring inside and outside diameter.

—**Gauge**—A tool or standard for measuring with great accuracy.

—**Micrometer**—A caliper having a micrometer screw.

—**Rule**—An outside caliper formed by a rule having a graduated slide at one end.

—**Vernier**—A steel caliper with a vernier attachment which reads to thousandths of an inch.

**Calk**—To drive tarred oakum into the seams between planks and fill with pitch.

**Calked Rivet**—A rivet which has not been properly driven so as to fit tightly in the hole, but to which a seeming tightness has been given by turning the edge of the head under with a cold cut or similar tool.

**Called Bonds**—Most bonds can be called in and paid at a premium before they mature. During a period of declining interest rates many corporations "call" or re-

deem outstanding bond issues bearing a high interest rate and refund the debt by issuing new bonds bearing a lower interest rate.

**Calomel**—(See horn quicksilver.)

—A mercuric chloride,  $\text{Hg}_2\text{Cl}_2$ , containing 15 per cent chlorine, and 85 per cent of mercury. Sometimes called "horn mercury."

**Calorie**—The amount of heat required to raise the temperature of one gram of water one degree centigrade at or near the temperature of maximum density. Called small calorie.

**Calorimeter**—An instrument for measuring heat of solution. Used in studies of Portland cement.

**Cam**—A device used to convert rotary into reciprocating motion; commonly an eccentric disc.

—**Engine**—A type of engine in which the pistons are reciprocated by means of a cam-and-roller mechanism.

—**Switch**—In electricity, an electric switch whose points are operated by means of a disk with an irregular periphery.

**Camber**—Rise or crown of the center of a bridge or structural member or flow line of a culvert, above a straight line through its ends.

—(of a road)—(See crown.)

—(aeronautics) The rise of the curve of an airfoil section, usually expressed as the ratio of the departure of the curve from a straight line joining the extremities of the curve to the length of this straight line. "Upper camber" refers to the upper surface; "lower camber" to the lower surface; and "mean camber" to the mean line of the section. Camber is positive when the departure is upward, and negative when it is downward.

**Cambering Machine**—A machine for giving hot railroad rails as they come from the rolls the curvature necessary to compensate the unequal cooling of head and base, so

they will be as nearly straight as possible when cold.

**Cambrian**—The oldest of the systems into which the Paleozoic stratified rocks are divided; also the corresponding geologic period.

**Cambric Needle No. 2**—Asphalt penetration testing needle.

**Camel-Back Truss**—A truss having a broken outline for the upper chord taking the humped shape of a camel's back.

**Camptonite**—Dike rocks having the mineralogical composition of diorites; i. e., with dark brown hornblende, plagioclase, magnetite, and more or less augite.

**Canada-Balsam**—A transparent and fluid oleo-resin yielded by a North American species of silver fir; used for mounting microscopic preparations and for cementing glass in optical instruments.

**Canal**—An artificial waterway usually of more or less uniform dimensions. There are ship canals for sea-going vessels and barge canals for inland waterway vessels, and canals that conduct only water.

**Canard Airplane**—A type of airplane having the horizontal stabilizing and control surfaces in front of the main supporting surfaces.

**Cancellation**—A system or arrangement of the web members in a truss.

—**Double**—The arrangement of the web members of a truss having a complete system of diagonals.

**Cancrinite**—A mineral belonging to the hexagonal system, having the composition  $3\text{NaAlSiO}_4 \cdot \text{CaCO}_3$ . Also a prefix to the names of rocks containing it, such as cancrinite-syenite, etc.

**Candle**—Is the unit of light intensity. At a distance of one foot, a candle produces one-foot candle (equivalent to one lumen per square foot) upon a surface normal to the beam.

**Candlepower**—A light unit, or that amount of light given by a sperm candle burning 120 grams per hour.

- Cane**—Used to construct small revetment where levee is sloughing. A jointed wood growth of the grass family; grows extensively in the South, 20 to 30 feet high.
- Canister**—A tin for holding blasting powder.
- Canopy, Parachute**—The main supporting surface of a parachute.
- Cantilever**—That part of a structure or structural member that extends beyond its support.
- Bracket**—A bracket cantilevered out from another member.
- Deck**—A cantilever bridge in which the traffic is borne by a floor system supported by the top chords or the upper portion of the posts.
- Draw, Double Rotating**—(See double rotating cantilever draw.)
- Retaining Wall**—A reinforced concrete wall having an upright section and a base, each of which resists by cantilever action the pressure to which it is subjected. Cantilever action is that condition of a beam or wall section in which one end is fixed and the other end unsupported.
- Span**—Often referred to as that span of a bridge which contains two cantilever arms and a suspended span. In some cases the suspended span (most improperly) is omitted.
- Through**—A cantilever bridge in which the traffic passes between the trusses, in contra-distinction to a deck cantilever where it passes above the top chords.
- Cantilever-arm**—The projecting arm in a cantilever bridge.
- Canting (of Rail)**—The inclination inwardly of a railroad rail, effected by the use of inclined tie plates or by inclined dapping of the ties.
- Canyon, Box**—(See box canyon.)
- Cap (transverse)**—A horizontal member which rests directly on the tops of piles or posts connecting them to form a pile bent and on which stringers or bridge shoes are placed.
- Rock**—In geology, the more impervious rock found above an oil or gas-bearing stratum.
- Capacity**—The volume of the gas cell or cells of an aerostat.
- Compressor, Actual**—The capacity of an air or gas compressor is the actual amount of air or gas compressed and delivered, expressed in cubic feet per minute at intake temperature and pressure. The delivery measurement to be actually made by low pressure orifice test.
- Current**—In electricity, an alternating current leading the electromotive force.
- Curve**—A graph of the volume of a reservoir, tank, etc., as a function of elevations. The capacity of a reservoir can be defined only by reference to some definite elevation.
- Measurement**—The following are standard methods for measuring the capacity being pumped by deep well turbine pump: (a) By volumetric calculation when pumping into accurately measured reservoirs or tanks; (b) Venturi meters; (c) V-notched weir; (d) rectangular weir; (e) thin plate orifice.
- Of a Substance, Thermal**—(See thermal capacity of a substance.)
- Cape Chisel**—A hand tool made from a short steel bar having one end flat and the other tapering to a blunt edge sharpened at an obtuse angle to prevent breaking. Used in connection with a hand hammer for chipping cast iron. It differs from a cold chisel in having a narrower blade with more stock behind it.
- Capillarity**—The peculiar action by which the surface of a liquid, where it is in contact with a solid (as in a capillary tube) is elevated or depressed. Capillarity depends on the relative attraction of the molecules of the liquid for each other and for those of the solid.
- In soil stabilization, capillarity is

the ability of the soil to transmit moisture in all directions regardless of any gravitational forces.

**Capillary Fringe**—In hydrology, the belt of subsurface water overlying the zone of saturation in material having capillary interstices, the smaller of which are filled with water that is continuous with the zone of saturation but held above that zone by capillary forces acting against gravity. Materials having only subcapillary interstices are impermeable and are not regarded as having a capillary fringe.

—**Water**—In soil physics and hydrology, water held above the water table in soil by capillary force.

**Capital**—In architecture, the crowning member or division of a column or pilaster.\*

**Capitalization**—The capitalization of a corporation is the total of stocks, bonds and notes it has issued.

**Capitalize**—In engineering economics, to divide an annual operating or maintenance expense by a rate of interest. The quotient thus obtained is called the capitalized cost of the annual expense.

**Capstan**—A mechanism for handling in an anchor chain or cable or mooring lines.

—A device for rolling up rope or cable under tension in moving an object.

**Capstone**—In masonry, the uppermost or finishing stone of a structure.

**Cap-Stringer Strap**—A piece of round, square, or structural shape iron or steel, either straight or bent, used to fasten stringers to a cap by means of horizontal bolts without the use of drift bolts.

**Cap-Strip**—A continuous member on the outer edge of a wing rib.

**Captive Balloon**—A balloon restrained from free flight by means of a cable attaching it to the earth.

**Car**—A structure in, or suspended from, the hull or envelope of an

airship for carrying crew, engineers, passengers, etc.

**Car, Heavy Duty**—A railway motor car weighing from 1400 to 2000 pounds, or more, and designed for hauling trailers and such other equipment as ballast discers and weed mowers; it is also used for hump yard service. Seats and decks are sometimes lengthened to accommodate a large number of men. It is propelled by engines ranging from 12 to 30 H.P.

—**Heavy Section**—A railway motor car weighing from 1200 to 1400 pounds with a seating capacity for 10 to 12 men, is equipped with 8 to 12 H.P. engines. Used largely with large section or extra gangs and will haul one or more trailers with men and tools.

—**Light Inspection**—A railway motor car designed to carry one or two men and tools. They vary in weight from about 400 to 600 pounds, the lighter car being designed for use by one man. They usually have a load capacity of 650 to 800 pounds.

—**Light Section**—A railway motor car weighing from 750 to 900 pounds with a seating capacity of 4 to 6 men and capable of being handled on or off the track by two men. Cars of this type are usually propelled by 4 to 6 H.P. engines. It is commonly used by small section and similar maintenance of way gangs.

—**Subcloud**—An observation car which may be lowered from an airship to a position below the clouds.

**Carbenes**—The components of the bitumen in petroleum, petroleum products, malthas, asphalt cements and solid native bitumens, which are soluble in carbon disulfide but insoluble in carbon tetrachloride.

**Carboazotine**—An explosive mixture of nitre, lampblack, sawdust, and sulphur with a little iron sulphate.

**Carbonaceous**—Coaly, containing carbon or coal. Especially shale or rock containing small particles

of carbon distributed throughout the whole mass.

**Carbonite**—An explosive mixture of nitrobenzene, potassium nitrate, sulphur, and kieselguhr.

**Carbonizing Flame**—A welding flame having acetylene in excess of that required to produce a neutral flame.

**Carbon—Fixed**—(See fixed carbon.)

—**Free**—(See free carbon.)

**Carboy**—A large globular glass bottle enclosed in a box or in wickerwork; used mainly for the transportation of corrosive acids.

**Carburetor**—A device by which the gasoline used in the cylinder of an internal combustion engine is vaporized and mixed with air for proper combustion.

**Card (or card magnetic) Compass**—A magnetic compass in which the magnets are attached to a pivoted card on which the directions are marked.

—**Process**—In wood preservation, the pressure treatment with a mixture of oil and a water solution of a salt, usually creosote and zinc chloride, the mixture being kept uniform by means of a circulating pump.

**Cardinal Points**—The four principal points of the compass, as North, South, East, and West.

**Cargo**—Commodities transported by a vessel or vehicle upon which a freight charge may be made.

**Carnegie Mill Sections**—8 in. and 9 in. wide flanged beams with beveled inside faces of flanges.

**Carnot's Function**—A relation between the amount of heat given off by a source of heat, and the work which can be done by it.

**Carpet**—A bituminous surface of appreciable thickness, generally formed on top of a roadway by the application of one or more coats of bituminous material with gravel, sand, or stone chips added (obsolete).

**Carrara Marble**—A general name

given to all the marble quarried near Carrara, Italy. The prevailing colors are white to bluish, or white with blue veins; a fine grade of statuary marble is here included.

**Carriage Rope**—A rope for traveling the carriage on a cableway. Also called traction rope.

**Carrier**—(noun) A corporate company, owner of physical property and other assets used in or held for transportation service.

—(adj.) Applicable to physical property of a railway and other assets used in or held for transportation service.

—Chemically, a catalytic by whose agency a transfer of some element or group is effected from one compound to another.

**Cartridge Fuse**—In electricity, a safety fuse within a noncombustible cover to prevent sparks from flying.

**Caryatid**—In architecture, a sculptured female figure acting as a column in a building. The most noted are those in the south portico of the Erechtheion at Athens.\*

**Cascade Converter**—In electricity, a motor converter.

**Case Hardening**—A process of hardening (iron or steel) by carbonizing the surface, thus converting soft iron into steel or mild steel into hard steel. Heating is done in contact with charcoal.

**Casing-Head Gas**—(See combination gas.)

**Cassiterite**—A tin dioxide,  $\text{SnO}_2$ , containing 21 per cent oxygen and 79 per cent tin. An important ore of tin.

**Casing Lines**—A line used with a multiplying block for handling oil well casings.

**Cast**—To make a casting out of molten metal.

—**Iron**—Iron containing so much carbon that, as cast, it is not usefully malleable at any temperature. It usually contains from 1.7 to 4.5 per cent carbon and in most

- cases an important percentage of silica.
- Castellated Nut**—A nut having slots cut crosswise in the upper portion. The nut is screwed on a bolt so that one of the slots coincides with a hole through the bolt to permit of inserting key, thus securing the nut.
- Casting**—(verb) Disposing of excavated material by a single operation either by hand or machinery.
- The act or process of founding. That which has been cast by pouring molten metal into a mold.
- Base**—A steel or iron casting upon which the bridge-shoe rests.
- Centering**—A casting used to bring a movable span to exact position when seated.
- Castings, Chilled**—Castings which are rapidly cooled during solidification.
- Cast-in-Place Piles**—Piles which are cast in holes in the ground. (See pre-molded concrete piles.)
- Cat Hole**—A small hole dug in rock for a point of a tripod leg of a machine drill.
- Walk**—A narrow footway along the keel of a rigid airship.
- Catalytic Agent**—In chemistry, a substance which by its mere presence alters the velocity of a reaction, and may be recovered unaltered in nature or amount at the end of the reaction.
- Catapult**—A device by which an airplane can be launched at flying speed.
- Catawberite**—A rock in South Carolina that is a mixture of talc and magnetite.
- Catch Basin**—A receptacle for diverting surface water to a sewer or subdrain, having at its base a sediment bowl to prevent the admission of grit and other coarse material into a sewer.
- Catchall**—A tool for extracting broken implements from drilled wells.
- Catchment Area or Basin**—In soil conservation, a watershed; drainage basin, also the area of such a basin.
- The area of a watershed tributary to a lake, stream, or sewer.
- Catenary**—The curve assumed by a suspended span of rope when carrying no load except its own weight.
- (See hydrostatic catenary.)
- Construction**—A wire held level and straight by suspending it at frequent intervals from another wire or strand suspended with sag in the usual manner; the sagged rope conforms to the equations of a catenary curve.
- Cathodogram**—An X-ray photograph.
- Catlinite**—A local name in Minnesota for a red, siliceous argillite that was used by the Indians for pipe bowls.
- Catspaw**—A hitch or method of fastening a rope to a hook without clamps. Formed by doubling back the bight of a rope forming two loops in opposite directions with the extending parts of the rope inside.
- Cattle Grid (or Guard)**—An open floor capable of being crossed by vehicles but not by stock.
- Cauliculi**—In architecture, the eight stalks from which spring the volutes of the Corinthian capital.\*
- Caulk**—To fill seams or joints in such manner as to prevent leaking.
- Cavel**—A stone mason's ax.
- Cavern Flow**—In hydrology, the movement of water in turbulent flow through large openings in rocks such as caves, or through coarse sorted granular material. It may be produced either directly by gravity, when it corresponds with the flow of water in surface streams, or by hydrostatic pressure, when it corresponds with the flow of water through pipes.
- Limestone**—Any limestone abounding in caverns, especially the carboniferous limestone of Kentucky.
- Cavetto**—A concaved moulding, usu-

ally of quarter-circular section.\*

**Cavitation**—A condition wherein a vacuum of any degree exists as a result of flowing water. Complete cavitation obtains when the pressure within the affected part is reduced to that of the vapor pressure of the water.

**Ceiling**—Height of the lower level of a bank of clouds above the ground.

—**Balloon**—A small free balloon, whose rate of ascent is known, used to determine the ceiling.

—**Light**—Same as ceiling projector.

—**Projector**—A projector that produces an illuminated region on the under side of a cloud for the purpose of determining the height of that part of the cloud above the indicator.

**Ceiling-Height Indicator**—A device that measures the height from the horizontal to the illuminated spot produced by a ceiling projector as seen from a fixed position.

**Celite**—A term given by Tornebohm to a constituent of Portland cement, later identified as  $C_4AF$ .

**Cell**—A unit of a primary or secondary battery.

—**Gas**—In an airship, one of the bags containing the aerostatic gas.

**Cells**—In the case of hollow tile, the openings parallel with its shell and web.

**Cellular**—(rock) Refers to the porous texture, and fairly large cavities of certain volcanic rock.

—**Retaining Wall**—A retaining wall with a base, longitudinal upright sections, and a series of transverse walls, dividing the space between the longitudinal sections into cells which may be filled with earth or other suitable material.

**Cellule** (or cell)—In an airplane, the entire structure of the wings and wing trussing of the whole airplane on one side of the fuselage, or between fuselages or nacelles, where there are more than one.

**Cement (Portland)**—Is the product

obtained by finely pulverizing clinker produced by calcining to incipient fusion an intimate and properly proportioned mixture of argillaceous and calcareous materials, with no additions subsequent to calcination excepting water and calcined or uncalcined gypsum.

**Cement Bag Dam**—A dam constructed of dry concrete mixture in bags. Bags are placed to form the structure and then watered.

—**Concrete**—(See concrete Portland cement.)

—**Factor** (of concrete)—The quantity of cement in a cubic yard of concrete. Thus, if 5 sacks of cement are required for one cubic yard of concrete, the cement factor is 1.25 bbl. per cu. yd. and the yield is 5.4 cu. ft. of concrete per sack of cement.

—**Gun**—A trade name applied to an apparatus used for the placing of mortar under pressure, the characteristics being that the mortar is forced dry to the nozzle, hydration taking place at the nozzle, and coincident with the application.

—**High-Early-Strength**—(See high-early-strength cement.)

—**Natural**—(See natural cement.)

—**Neat**—A mixture of Portland cement and water.

—**Puzzolan**—(See Puzzolan cement.)

—**Rock**—An argillaceous limestone used in the manufacture of natural hydraulic cement. Contains lime, silica, and alumina in varying proportions, and usually more or less magnesia.

—The impure clayey limestone, used for the manufacture of Portland cement in the Lehigh district, is known technically as "cement-rock."

—**Sand Bed** (for paving brick)—This is composed of a mixture of fine aggregate and Portland cement.

**Cementation**—The process of converting wrought iron into steel

- while heating it in contact with charcoal.
- (of rock)—This is accomplished by the deposition, in the pores of the rock mass and between the particles, of a substance which will bind them together.
  - Index** (of cement)—Result calculated from a formula used to express quantitatively the relation between the composition and hydraulic value of cement.
  - Cemented**—Bonded. Referring to water-bound macadam, the term "cemented" is used to designate that condition existing when, after rolling the stone forming the crust, the remaining voids have filled with the finer sizes, and the stone dust or "flour" has, under the action of water, taken a "set" as does cement itself.
  - Soil (Cementation)**—A condition occurring when the soil grains or aggregates are caused to adhere firmly and are bound together by some material that acts as a cementing agent as colloidal clay, iron, silicon or aluminum hydrates, lime carbonate, etc.
  - Steel**—Steel produced by impregnating bars of wrought iron or soft steel with carbon at a temperature below the melting point.
  - Cementing Value**—In material testing, a measurement of the binding power of rock, dust, clay, sand, clay, etc., after wetting, consolidating and drying.
  - Cenozoic**—The latest of the five eras into which geologic time, as recorded by the stratified rocks of the earth's crust, is divided; it extends from the close of the Mesozoic era to and including the present.
  - Center**—The heart or core around which the strands of a wire rope are laid.
    - The exact middle.
    - Axis of revolution.
  - Aerodynamic** — (See aerodynamic center, wing section.)
  - Elastic** (stress analysis)—A point within the wing section at which the application of a single concentrated load will cause the wing to deflect without rotation and, conversely, a point within the wing section about which rotation occurs when the wing is subjected to a rotational deflection.
  - Line** (bridge, culvert)—The median axis of a bridge, culvert, sewer or drain, in the direction of its length.
  - Of Buoyancy** (aerostat)—The center of gravity of the air displaced by a balloon or airship. It is approximately the center of gravity of the contained gas.
  - Of Buoyancy** (seaplane)—The center of gravity of the fluid displaced.
  - Of Inertia**—That point in a body which is so situated that the force or combination of forces requisite for producing motion in the said body, or bringing it to rest or changing its motion in any way, is equivalent to a single force applied at the said point. This point coincides with the center of gravity of the body.
  - Of Moments**—The point about which a body tends to rotate. Often a point arbitrarily chosen for convenience in determining the resultant moment of a system of forces.
  - Of Pressure of an Airfoil**—The point in the chord of an airfoil, prolonged if necessary, which is at the intersection of the chord and the line of action of the resultant air force.
  - Of Pressure Coefficient**—The ratio of the distance of the center of pressure from the leading edge to the chord length.
  - Of Rotation**—The point of a rotating body which remains at rest while all the other points revolve around it.
  - Of Symmetry**—The intersection of the axes of symmetry.
  - Section**—The central panel of a

wing; in the case of a continuous wing or any wing having no central panel, the limits of the center section are arbitrarily defined by the location of points of attachment to the cabane struts or fuselage.

—(Railroad)—A line adopted to be the mid points between rails.

—**Reduction to**—(triangulation) The computation of the necessary corrections to allow for an eccentric set-up (that is, a set-up in which the instrument does not occupy the point under signal).

—(Surveying)—A middle line or axis for construction or design.

—**Stakes**—Stakes indicating the center line.

—(Of Transit) — Manufacturer's term for either of the two vertical spindles (axes) of the transit. The outer (hollow) center revolves in a socket, and is attached to the graduated horizontal circle. The inner center revolves in a socket in the outer center, and is attached to the alidade, or upper portion of the instrument.

—The common point of intersection of the vertical axis, the horizontal (cross) axis, and the axis of the telescope tube.

**Centering**—The temporary supports of arch ribs used in arch construction. Falsework for an arch.

**Centers**—(See centering.)

**Centi-Ampere**—In electricity, the one-hundredth part of an ampere.

**Centigram**—A weight equal to one-hundredth part of a gram, or 0.15432 of a grain.

**Centrifugal Compressor**—(See turbo.)

—**Force**—A force directed outward when any body is constrained to move in a curved path; flying away from the center.

—**Load**—The horizontal load on a structure produced by the centrifugal reaction caused by the velocity and mass of a moving train as it passes around a curve.

—**Pump**—A pump in which the pres-

sure is developed principally by the action of centrifugal force. Pumps in this class with single inlet impellers usually have a specific speed of below 4000, and with double suction impellers a specific speed of below 5500. In pumps of this class the liquid enters the impeller at the hub and flows radially to the periphery.

—**Screw or Propeller Pump**—A centrifugal pump having a screw type impeller. May be axial flow or combined axial and radial flow type.

**Centrifugal-Type Supercharger**—A high-speed rotary blower equipped with one or more multi-blade impellers which, through centrifugal action, compress the air or mixture in the induction system.

—**Volute Pump**—A centrifugal pump having a casing made in the form of a spiral or volute.

**Centrifuge**—(sewerage) A device in which sludge is dewatered by rapid rotation.

—A device for removing liquids from materials by rapid rotation.

**Centrifuge Moisture Equivalent**—In soil technology, the moisture content, expressed as a percentage of the weight of the oven-dried soil, retained by a soil sample after first being soaked in water for 6 hours, then drained in a humidifier for 12 hours, and finally centrifuged under an acceleration of 1000 times gravity for one hour.

**Centripetal Force**—The force required to keep a moving mass in a circular path. Centrifugal force is the name given to the outward force of a mass in rotation.

**Centroid**—The center of mass, or center of gravity. The point of application of the resultant of a system of stresses or forces.

**Ceresine**—A trade name for refined ozocerite.

**Cermak-Spirek Furnace**—An automatic reverberatory furnace of rectangular form divided into two

sections by a longitudinal wall. Used for roasting zinc and quick-silver ores.

**Cerussite**—A lead carbonate,  $\text{PbCO}_3$ , containing 16 per cent carbon dioxide and 84 per cent lead oxide.

**Cesspool**—A pit into which sewage or other liquid waste is discharged and from which the liquid leaches into the surrounding soil, or is otherwise discharged.

**Chain Drive**—A means of transmitting power employing the use of sprockets and chain in place of pulleys and belt.

—**Hog**—A chain cable or rod stretched over the straining posts in a log-chain truss. Same as the rod used for trussing a beam.

**Chain or Tape Gage**—A device for determining the state or elevation of a water surface, consisting of a tagged or indexed chain, tape, or other line attached to a weight which is lowered to touch the water surface, whereupon the gage height is read on a graduated staff or opposite an index. Especially suited to bridges, wells, and similar situations where the water is difficult to reach.

—**Grate**—A feeding device for furnaces.

—**Hoist**—A hoist in which chains are used for lifting loads.

—**Riveting**—A term applied to riveting where the rivets in the second or succeeding rows are placed directly back of those in the first row or preceding rows.

—**Tongs**—A pipe-fitter's tool; a lever with a serrated end provided with a chain to embrace the pipe.

**Chaining**—A term which originally meant measuring with a chain, but as now used it denotes measuring with either the chain or the tape. Measuring is governed by definite rules.

**Chalcedony**—A waxy form of silica, having the density and hardness of quartz, but a minute fibrous struc-

ture. Chalcedony is classed as a mineral as well as a rock.

**Chalcocite**—A sulphide of copper, having the formula  $\text{Cu}_2\text{S}$ . Contains about 20 per cent sulphur and 80 per cent copper.

**Chalcopyrite**—A sulphide of copper and iron,  $\text{CuFeS}_2$ , containing about 35 per cent sulphur, 35 per cent copper, and 30 per cent iron. An important ore of copper.

**Chamber Kiln**—A brick or tile kiln having chambers or compartments, sometimes so arranged that they can be heated successively.

**Chalk**—In geology, well known soft, slightly coherent rock consisting of a fine calcareous powder, which the microscope shows to be largely composed of tiny shells of foraminifera.

**Chamfer**—To bevel or sharpen to a blunt edge.

**Chandelle**—An abrupt climbing turn to approximately a stall in which the momentum of the airplane is used to obtain a higher rate of climb than would be possible in unaccelerated flight. The purpose of this maneuver is to gain altitude at the same time that the direction of flight is changed.

**Chandler** (ship)—One who furnishes equipment for a ship—anchors, chains, ropes, etc.

**Channel**—In quarrying, a narrow artificial incision across a mass of rock, which, in a granite sheet, is made either by a series of contiguous drill holes or by blasting a series of holes arranged in zigzag order.

—In marine use, a navigable passage in a river, lake or harbor, frequently buoyed, dredged and policed.

—That section of a stream, bay or estuary having the greatest depth and velocity of current—may or may not be the fairway or navigable passage.

—A structural or rolled steel shape used in bridge building and in other steel construction.

- In drainage, a waterway or depression in which a stream flows.
- Built**—A shape in the form of a channel fabricated from a plate and two angle irons.
- Column**—A column made up of two channel-irons laced or stayed.
- Patch**—A channel-shaped fabric fitting secured to the envelope of an aerostat to allow a rod or spar to be laced to the envelope.
- Protection**—Work done to protect the bed or banks of a channel against scour.
- Rolled**—A channel which is rolled in one piece, in contradistinction to the built channel.
- Chaparral**—In a general sense, any dense impenetrable thicket of stiff or thorny shrubs or dwarf trees.
- Chapman Shield**—A pair of vertical plates of sheet iron or steel arranged with a ladle between them, which can be moved longitudinally along the front of the furnace. Its main purpose is to protect the laborer from the furnace heat.
- Charco**—In soil conservation, a depression sometimes natural, sometimes constructed, that impounds water. Differs from a tank or reservoir in that the dam is not relied upon to back up the water.
- Charge**—In steel and iron manufacture, the molten pig iron placed in a Bessemer converter, or the solid pig iron, steel scrap, limestone and other materials placed in the open-hearth furnace for conversion into steel.
- The amount of money placed against a credit.
- To electrify.
- (noun)—the load, (verb) to load a container from a bin or other loading device.
- (noun) A combination of all the materials required for one complete batch.
- (noun)—In wood preservation, all the wood assembled for treatment in one cylinder at one time.
- (verb)—In wood preservation, to place the wood in the cylinder for treatment.
- Charging Rate**—In electricity, the electric current at which a storage battery is charged.
- Charging Tank**—In wood preservation, a calibrated tank used for supplying preservative to the cylinder and measuring the quantity of preservative used in the treating process.
- Chart, Nautical**—A representation on a horizontal plane, and according to a definite system of projection, of a portion of the navigable waters of the earth, including the shore lines, the topography of the bottom, and aids and dangers to navigation; it may be derived from hydrographic, topographic, or aerial surveys, or a combination thereof.
- Chat-Roller**—An ore-crushing machine, consisting of a pair of cast-iron rollers, for grinding roasted ore.
- Chats**—The gangue material which is found intimately mixed with the lead-zinc ores of Missouri and Oklahoma. It is closely akin to chert and is the by-product of metal mining.
- Chatterbump**—Short, sharp, rhythmic bumps in an untreated surface, traffic-bound road.
- Chatter Mark**—One of a series of short curved cracks on a glaciated rock surface. The individual cracks are transverse roughly to the striae, but the course of a series of chatter marks is parallel to the striae.
- Check**—A structure designed to raise or control the water surface in a canal or ditch; in irrigation terminology, an area of land enclosed in ridges to confine the irrigation water.
- A lengthwise separation of the wood which usually occurs across the rings of the annual growth.
- A small surface crack in concrete (attributed to drying).
- Dam**—In soil conservation, a small

- dam constructed in a gully or other watercourse to decrease the velocity of flow, thus minimizing channel scour and promoting the deposition of eroded material. Check dams may be made of a large variety of materials, including concrete, masonry, loose rock, boards, logs, brush, sod, earth, wire mesh, cloth, or even parts of discarded automobiles and other miscellaneous junk.
- Irrigation**—In soil conservation, a method by which a field, divided into compartments or checks, is irrigated by pooling water in them successively.
- Nut**—An extra nut which is screwed on a bolt tight against the first nut to prevent the latter from working loose.
- Checking**—Temporarily reducing the temperature or the volume of the air blast on a blast furnace.
- Chemical Compound**—Formed from two components by chemical action, distinguishing it from solutions, colloidal suspensions and mixtures. It is also homogeneous.
- Gaging** (hydraulics)—A process of measuring the flow of water by ascertaining the resulting degree of dilution of a chemical solution of known saturation introduced into the stream at a known rate.
- Precipitation**—Adding to and thoroughly mixing with the sewage such chemicals as will, by reaction with each other or with the ingredients of the sewage, produce a flocculent precipitant, and subsequent sedimentation.
- Sedimentation** accelerated by the coagulation of suspended or colloidal matter through the addition of chemicals.
- Chenhall Furnace**—A gas-fired furnace for the distillation of zinc from zinc-lead ores.
- Chenot Process**—The process of making iron sponge from ore mixed with coal dust and heated in vertical cylindrical retorts.
- Cherokite**—The dense, hard, brown or drab, silicified, residual sands, which constitute the cement of the chert breccias in the zinc mines in the Joplin district.
- Chert**—A very fine-grained dense rock consisting of opal or chalcedony, often with some quartz, and sometimes with accessory calcite, iron oxide, organic matter, sponge spicules, or other impurities. It is usually associated with limestones, either as entire beds or as isolated included masses. It has a homogeneous texture, and a white, gray, or black color.
- Cheveron**—In architecture, a zigzag ornamental moulding.\*
- Chicago Boom**—An erector's hoisting apparatus consisting of a timber or steel boom, without a mast, having a goose-neck casting on the lower end working in a saucer block on a temporary sill, and held in position by blocks and tackle attached to other parts of the structure.
- Chile Saltpeter**—Sodium nitrate.
- Chime**—The rim around the base of the tub of a wooden water tank, formed by the ends of the staves projecting below the bottom of the floor.
- Chine**—The intersection of the bottom with the sides or deck of a seaplane float.
- Chinked**—A term applied to a masonry or log dam in which the small spaces between rocks or logs are filled with small particles and mortar, or clay mud.
- Chinook**—A warm, dry wind which blows down the slopes of the leeward side of the Rocky Mountains, causing rapid evaporation and accompanied by a considerable rise in temperature.
- Chips**—Small angular fragments of stone containing no dust.
- Chisel**—A hard tool consisting of a sharp-ended blade designed to cut under the impulse of a blow.
- Boasting**—(See boasting chisel.)

- Cold**—A hand tool made from a short steel bar having a flat top and a tapering wedge-shaped end a trifle wider than the shank. Used for cutting metals while cold.
- Draft**—In stone masonry, a narrow plane surface cut with a pitching chisel along the outer edges of the face of an ashlar stone, usually cut the width of the chisel.
- Hot**—(See hot chisel.)
- Slogging**—A heavy chisel used for cutting off bolt heads.
- Splitting**—A wedge-shaped chisel.
- Chiseling** (erosion)—In soil conservation, a term for a tillage operation usually applied to a process of loosening the subsoil without turning; subsoiling.
- Chlorination**—Treatment with chlorine or bleaching powder for the purpose of disinfection, the retardation of decomposition, or oxidation of organic matter.
- Chlorine Demand**—The quantity of chlorine absorbed by sewage (or water) in a given length of time.
- Chlorite**—A general name for a group of minerals whose exact chemical nature is not yet well known. They are considered to be hydrous silicates of aluminum, containing ferrous iron and magnesium.
- Chloritization**—Metamorphic alteration of other material into chlorite.
- Choke**—To fill up the voids.
- Obstruct.
- To become clogged or foul.
- Choker**—A short length of wire rope for attaching logs, with a noose, to the skidder line.
- Chondri**—The rounded and ellipsoidal grains of silicates which may be characteristic of meteorites.
- Chonolith**—In petrology, a general term for injected igneous intrusions, having shapes so irregular or relations to the invaded formations so complex that terms like dike, laccolith, etc., are not applicable.
- Chord**—(public land surveys) The line of a great circle connecting any two selected corners on a base line, standard parallel, or latitudinal township boundary. Long Chord—(railroad or highway surveying) 1. Any chord (of a circular curve) longer than 100 ft. 2. The chord that extends from the point of curvature to the point of tangency.
- The top or bottom member of a truss.
- The line joining the ends of an arc.
- (aeronautic) An arbitrary datum line from which the ordinates and angles of an airfoil are measured. It is usually the straight line tangent to the lower surface at two points, the straight line joining the ends of the mean line, or the straight line between the leading and trailing edges.
- Bottom**—The lower member of a truss usually resisting tension.
- Broken Top**—A top chord in which each successive segment deviates or deflects from the line of its contiguous segment, at the panel point.
- Camel-back Top**—A top chord that is broken or deflects at two or, at most, three points.
- Direction** (stress analysis)—The direction parallel to the intersection of the plane of the internal wing truss with the plane of symmetry of the airplane. When a wing has two internal trusses in nonparallel planes, the plane bisecting the dihedral angle between those two planes should be used (cf. beam, drag, lift, and side directions).
- Force, or Component** (stress analysis)—A force, or component, in the chord direction; i. e., parallel to the intersection of the plane of the internal wing truss with the plane of symmetry of the airplane (cf. beam, drag, lift, and side forces).
- Length**—The length of the pro-

jection of the airfoil profile on its chord.

—**Mean Aerodynamic**—The chord of an imaginary airfoil which would have force vectors throughout the flight range identical with those of the actual wing or wings.

—**Mean, of a Wing**—The quotient obtained by dividing the wing area by the span.

—**Parabolic**—A chord of a truss in which the panel points lie on the arc of a parabola.

—**Splice**—A joint made in a chord of a truss, in which the main parts of the member are joined together by butting and riveting continuous plates across the joint.

—**Top**—The upper member of a truss, usually resisting compression.

—**Top, Polygonal**—(See polygonal top chord.)

—**Wire**—A wire joining the vertices of a main transverse frame.

**Christobalite**—A dull white silicon dioxide ( $\text{SiO}_2$ ), that crystallized in the orthorhombic system, and is closely related to tridymite.

**Chromatic Aberration**—Due to the difference in the index of refraction for different wave lengths, light of various wave lengths from the same source cannot be focused at a point by a simple lens. This is called chromatic aberration.

**Chromite**—An iron chromium mineral,  $\text{FeCr}_2\text{O}_4$ , containing 68 per cent chromium and 32 per cent iron. An important ore of chromium.

**Chromometer**—An instrument for determining the color of petroleum and other oils.

**Chronoscope**—In electricity, an instrument for measuring minute intervals of time.

**Chrysolite**—An orthorhombic complex silicate containing magnesium, iron, and silica. Usually colored green.

**Chuck**—That part of a machine drill which grips or holds the drill.

**Churn Drill**—Also called cable drill

or well drill. A portable drilling equipment usually mounted on four wheels and driven by gasoline, electricity, or steam. The drill head is raised by means of a rope or cable and allowed to drop, thus striking successive blows by means of which the rock is pulverized and the hole deepened.

**Chute**—A short, straight channel which by-passes a long bend in a river and formed by the river breaking through a narrow land area between two adjacent bends.

—A narrow back channel on one side of an island. (Local, used on rivers.)

—An opening in a river dam for the descent of logs.

—A narrow open or closed top spout from a bin or container.

—A high-velocity conduit for conveying water to a lower-level.

—An inclined drop or fall.

**C.I.F.**—A commercial transportation term meaning "Cost, Insurance, and Freight." It is intended to cover the cost of certain goods at point of destination. Usually applied to marine transport.

**Cinder**—Slag, particularly from iron blast furnaces; a scale thrown off in forging metal; scoriaceous lava from a volcano.

—**Buckshot**—(See buckshot cinder.)

—**Heat**—The heating of a bloom or ingot in a heating furnace to such a degree that a certain amount of oxide or scale formed on the outer surface of the piece melts and runs off.

—**Pig**—A pig iron made from smelting top cinder or bulldog with ores.

**Cinders**—The residue from the coal burned in locomotives and other furnaces.

**Cinnabar**—A vermilion-colored mercury sulphide,  $\text{HgS}$ , 86 per cent mercury. It is the common ore of mercury and occurs as hexagonal crystals.

**Cipolin**—A marble spotted with mica and forming a transition between marbles and mica-schists, two rocks which are often associated.

**Cipolletti Weir**—A weir notch of trapezoidal shape in which the sides of the notch are given a slope of 1 horizontal to 4 vertical to compensate for end contractions; named after Cesare Cipolletti, an Italian engineer; widely used for the measurement of irrigation water.

**Circa**—About; around; often used in English with numerals to denote approximate accuracy.

**Circuit**—In electricity, the complete path of a current.

—**Breaker**—In electricity, a device for breaking a current.

—**Ferric**—(See ferric circuit.)

—**Shunt**—(See shunt circuit.)

**Circular Mil**—A unit of area used in measuring cross-sections of wires; 0.7854 square mil.

**Circumferential Flow**—Flow parallel to the periphery of a circular tank.

**Cirque**—A steep-walled, amphitheatrical recess in a mountain side, generally ascribed to glacial erosion.

**Clamp**—An instrument for lifting stone so designed that its grip on the surface of the stone is increased as the load is applied. That portion engaging the stone is of wood attached to a steel shoe, which in turn is hinged to the shank of the clamp in such a manner as to adjust itself to the surface of the body lifted.

—**Drill**—A drill having a clamp to hold it to the work.

**Clap Sill**—In hydraulic engineering, a miter sill; the bottom part of the frame on which lock gates shut; a lock sill.

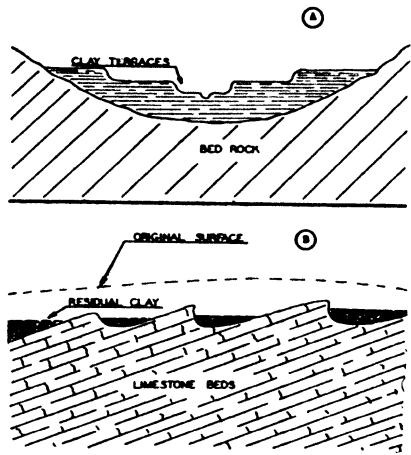
**Clarification**—The removal of the suspended and colloidal matters.

**Clarified Sewage**—Loosely used for sewage from which suspended matter has been partly or completely removed.

**Clark Process**—A process for softening water by the addition of slaked lime, which precipitates calcium bicarbonate by forming with it the insoluble normal carbonate.

**Classification**—Arranging the material in groups according to its character.

**Clastic**—Composed of broken fragments or grains cemented together. Sandstones are typical of this nature.



(A) Profile of clay terraces formed by stream action. Transported clay.

(B) Residual clays formed from limestone.

**Clay**—A fine argillaceous material which is more or less plastic when wet. The most important constituent of clay is hydrous aluminum silicate gel, a colloidal material, which remains suspended indefinitely in water, but may be thrown down as coagulated matter by salt solutions. When dry, clay is a fine, earthy material having a characteristic odor when moistened by the breath. It clings to the tongue, and makes a smooth paste when rubbed to an incoherent mass between the fingers. When pure, clay is white, but it is commonly col-

- ored yellow, brown, or red by iron oxides, or gray, blue, or black by organic substances. The grain size of clay is commonly considered as minus 0.005 mm. (See soil, clay.)
- Bleaching**—(See bleaching clay.)
  - Gouge**—A thin seam of clay separating ore, or rock and rock.
  - Gravel**—Gravel which, in addition to the smaller-sized particles of silica, contains a percentage of clay so that under the puddling action of the drag, a certain cementitiousness is developed which produces a dense, firm surface.
  - Loam**—A clay loam is a fine-textured soil which breaks into clods or lumps that are hard when dry. When the moist soil is pinched between the thumb and finger it will form a thin ribbon which will break readily, barely sustaining its own weight. The moist soil is plastic and will form a cast that will bear much handling. When kneaded in the hand it does not crumble readily, but tends to work into a heavy compact mass.
  - Marl**—A whitish, smooth, chalky clay; a marl in which clay predominates.
  - Marine**—Clay deposits laid down on the ocean bottom.
  - Pipe**—Made from red burning plastic clay devoid of fissile structure. Maturing temperature about 1700 deg. C. Vitrification not ordinarily produced, and salt glazing not always effective.
  - Rock**—A rock made up of fine argillaceous detrital material and chiefly that derived from the decomposition of the feldspars; indurated clay, hardened to be incapable of using as a clay without grinding, but not chemically altered or metamorphosed.
  - Slate**—Metamorphosed clay, with new cleavages developed by pressure and shearing.
  - Varve**—A layer of clay silt, as deposited annually in an old lake bed or body of still water, as individual layers characteristic of each season and different in thickness depending on rainfall. A succession of these annual deposits gives a time record for study of geologic times. The layers form characteristic groups that may be identified in deposits studied.
  - Claypan**—An horizon of accumulation or a stratum of stiff, compact and relatively impervious clay. Claypan is not cemented, and if immersed in water can be worked to a soft mass.
  - Clean River**—In regard to sewage, one which gives no sensuous evidence of sewage pollution and from which a wholesome drinking water can be obtained by practicable methods of water purification.
  - Clearance**—(bridge) The unobstructed width and height of the roadway or waterway of a structure.
  - (bridge) The additional space allowed for the fitting together of members over that nominally required, in order to provide for slight irregularities of workmanship or materials.
  - Clear-headway** (bridge)—The vertical distance from the upper surface of a floor to the lowest part of the overhead bracing. It is the measure of height of the tallest vehicle that could pass through the bridge.
  - Clearing**—Removing natural and artificial perishable obstructions to grading.
  - Cutting down and removing timber and brush.
  - Cleat**—A piece of wood, metal or other material, fastened transversely to the side of a fence post below the ground to give it greater stability.
  - Cleavage**—In petrology, a tendency to cleave or split along definite, parallel, closely spaced planes, which may be highly inclined to the bedding planes. It is a secondary structure, commonly confined to bedded rocks, is developed by pressure, and ordinarily is ac-

- accompanied by at least some recrystallization of the rock.  
 —When applied to a mineral, designates a structure consequent upon the geometric arrangement of its molecules at the time of its crystallization.
- Clevis**—A connecting iron bent into the form of a horseshoe, stirrup, or letter U.
- Cliff**—(See diagram near definition of beach.)
- Climate**—The sum total of all atmospheric or meteorological influences which combine to characterize a region and give it individuality by influencing the nature of its land, forms, soils, vegetation, and land use.
- Climatic Year** (hydrology)—A year selected for the presentation of data on stream-flow, precipitation, etc.; the climatic year of the United States Geological Survey called a water year, extends from October 1 to September 30 following.
- Clinker**—The sintered product obtained in the manufacture of Portland cement, which, when pulverized with the addition of calcium sulphate, produces Portland cement.
- Clinometer**—A simple apparatus for measuring by means of a pendulum or spirit level and circular scale, vertical angles, especially dips.
- Clinton Ore**—An iron ore which is also called fossil, pea, or dyestone ore. It was first discovered at Clinton, N. Y., and is one of the most persistent iron-ore deposits known. Two textural varieties are recognized: (1) fossil ore, and (2) oolitic ore. The former is made up almost entirely of fossil fragments, while the latter consists of small, rounded grains of concretionary character.
- Cloister**—A covered passageway usually connecting the major structure with minor related structures.\*
- Closed Basin**—A district draining to some depression or lake within its area, from which water escapes only by evaporation.
- Coil Winding**—In electricity, an armature winding, the coils of which form a closed circuit.
- Column**—A column that is boxed in, shutting out water and air, generally making the interior inaccessible for painting.
- Impeller**—(See impeller, closed.)
- Mortgage**—Under a closed mortgage, bonds which may be issued on the property are limited to a certain definite sum.
- Close-Jointed** (rock)—A term applied to rock containing joints that are very near together.
- Close-Quartered Reamer**—A pneumatic reamer having a cutting tool with a short shank, for working in restricted spaces.
- Closer**—A narrow stone used to finish a course of masonry.
- Closing Rope**—The wire rope used on a clam shell or orange peel bucket that closes the bucket and lifts it while closed.
- Closing the Horizon**—Measuring, at a triangulation station, the horizontal angles between successive stations around the horizon so as to return to the starting point; the sum of the angles should equal 360 degrees. Measuring the last angle of the series, closing on the starting point.
- Closure, Error of**—(of a traverse) The amount by which the computed position of the last point of the traverse fails to coincide with the initial point; that is, the length of line necessary to close the traverse. Frequently, also, the ratio of the linear error of closure to the perimeter (also known as the "error of the survey").
- (of angles) The amount by which the sum of the measured angles fails to equal the true sum.
- (of azimuths) The amount by which the measurement of the azimuth of the first line of a tra-

- verse, made after completing the circuit, fails to equal the initial measurement.
- (of a level circuit) The amount by which the last computed elevation fails to equal the initial elevation; or, the amount by which the differences of elevation in a circuit fail to add up (algebraically) to zero.
  - (of horizon) The amount by which the sum of the angles measured around the horizon differs from 360 degrees.
  - (of a triangle) The amount by which the sum of the three angles of a triangle differs from the true sum; that is,  $180^\circ +$  the spherical excess.
- Cloth Oil**—A name given to one of the distillates of crude petroleum (specific gravity 0.875) which is used for oiling wood.
- Cloud Point**—The temperature of a petroleum oil at which paraffin wax or other solid substances begin to crystallize out or separate from solution when it is chilled under definite prescribed conditions.
- Club Dolly**—A dolly with a steel hammer head and an iron handle attached. The smaller end of the hammer head has a cup-like indentation for holding the rivet head. Usually a maul is held against the big end of the hammer head while rivets are being driven.
- Coagulation**—The formation or gathering into flocs or groups, particles of finely divided suspended matter through the addition of coagulents to the water.
- The flocculation of colloidal or suspended matter brought about by the addition of some chemical to the liquid, by contact, or by other means.
- Coal, Block**—(See block coal.)
- Bunker**—A place for storing coal, especially in steamships for furnace use.—(See bunker coal.)
  - Crop**—(See crop coal.)
  - Fat**—(See fat coal.)
  - Flaxseed**—(See flaxseed coal.)
  - Measures**—Those strata of the carboniferous system which contain coal.
  - Oil**—The crude oil obtained by the destructive distillation of bituminous coal. That distillate obtained from such crude oil which is used for illuminating purposes.
  - Tar**—Tar produced by the destructive distillation of bituminous coal.
  - (See gas-house tar; water-gas tar; refined tar; coke-oven tar.)
- Coalescence**—The capacity for growing together, to fuse, to bind.
- Coarse and Fine Aggregates**—The term coarse is applied to a graded mineral aggregate in which the largest fragments have a diameter greater than  $\frac{1}{4}$ -inch and the term fine to one in which the largest fragments are less than  $\frac{1}{4}$ -inch diameter.
- Grained** (rock)—Refers to the texture of rock in which the individual minerals are large enough to see with the naked eye. Some authorities consider coarse-grained minerals to be larger than 5 mm.
  - Pointed or "C.P."**—In stone masonry work, this refers to the point depressions which are about 1 to  $1\frac{1}{4}$  inches apart with surface variations not to exceed  $\frac{3}{8}$ -inch from the pitch line.
  - Rack** (sewage)—A relative term, but generally used when the clear space between bars is 2 in. or more.
  - Screen** (sewage)—A relative term, but generally used when the openings are greater than 1 in. in least dimension.
  - (aggregates)—One having openings in excess of  $\frac{1}{2}$  in. in the least dimension.
- Coast**—(See diagram near definition of beach.)
- Coastal Beach**—Shelving and sloping beaches of sand, gravel, shingle or stone, swept by waves in time of storms and high tide. Often includes areas of low sand dunes.

**Coat**—(See carpet.) 1. The total result of one or more single surface applications. 2. To apply a coat.

—**Prime**—(See prime coat.)

**Coating**—A relatively thin application of protective substance, such as zinc (galvanizing), asphalt, tar, paint, etc., on either the inside or outside (or both) of a pipe, conduit, plate, form or other material.

**Cobaltite**—A sulpho-arsenide of cobalt,  $\text{CoAsS}$ , containing about 19 per cent sulphur, 45 per cent arsenic, and 36 per cent cobalt.

**Cobble**—Any piece of steel bent or twisted to such an extent it cannot be finished by rolling.

—A type of stone block a little larger than a paving brick. Also a round stone about six inches in diameter, used many years ago for paving. As distinguished from Durax, which are small stone cubes about  $3\frac{1}{2}$  in. cubes, cobblestones are 6 in. or larger.

**Cockpit**—An open space in an airplane for the accommodation of pilots or passengers. When completely enclosed, such a space is usually called a cabin.

—**Cowling**—A metal or plywood cowling placed around a cockpit.

**Code Beacon**—A flashing beacon light having a recognizable characteristic of dots and/or dashes by which its individual identity can be established.

**Coefficient, Hygroscopic**—(See hygroscopic coefficient.)

—**Of Contraction**—The ratio between the decrement of length, area of section, or volume and the original length, area of section, or volume.

—**Of discharge** (hydraulics)—A coefficient by which the theoretical discharges of water through orifices, weirs, and other hydraulic structures must be multiplied to obtain the actual discharges. Coefficients of discharge are obtained by experiments on struc-

tures similar to those to which they are applied.

—**Of Expansion**—Rate of change of volume per unit of temperature change (generally  $1^\circ \text{ F.}$ ).

—**Of Friction**—The ratio of the force required to move one over the other to the total force pressing the two together.

—**Of Impact**—In structural engineering, the ratio of the effect of a dynamically applied load to that of the same load applied statically, less unity. In other words, it is the factor nearly always less than unity, by which a static load effect must be multiplied in order to find the increment of the dynamic effect of applying the said load in a manner other than statically.

—**Of Imperviousness** (hydraulics)—The ratio, expressed decimally, of effectively impervious surface to the total catchment area.

—**Of Restitution**—For two bodies on impact, the ratio of the difference in velocity before impact to the difference after impact.

—**Of Roughness** (hydraulics)—A factor in the Kutter, Manning, Bazin, and other flow formulas representing the effect of channel roughness upon energy losses in the flowing water.

—**Of Temperature**—The relative change in dimensions of a material per degree.

**Coffer Dam**—A barrier built in the water so as to form an enclosure from which the water is pumped to permit free access to the area within.

**Cohesion, Moisture Film**—In soil stabilization, this is the resistance of particles to being pulled apart due to the surface tension of the moisture film surrounding each particle.

—**True**—In soil stabilization, this is the resistance of particles to being pulled apart due to the attraction between molecules at the point of contact.

- Coil Drag**—A tool to pick up pebbles, bits of iron, etc., from the bottom of a drill hole.
- Resistance**—(See resistance coil.)
- Spark**—(See spark coil.)
- Tesla**—(See Tesla coil.)
- Toroidal**—(See toroidal coil.)
- Winding, Closed**—(See closed coil winding.)
- Coils**—(tank car)—Tubes of piping placed or built in the shell of a tank car for purpose of heating.
- Coke**—The infusible, cellular, coherent solid material obtained from bituminous coal as the residue from its destructive distillation.
- Beehive**—(See beehive coke.)
- Breeze**—The fine screenings from crushed coke or from coke as taken from the ovens, of a size varied in local practice but usually passing a  $\frac{1}{2}$ -in. or  $\frac{3}{4}$ -in. screen opening.
- By-Product**—(See by-product coke.)
- Gas**—(See gas coke.)
- Oven Tar**—Coal tar produced in by-product coke ovens in the manufacture of coke from bituminous coal.
- Residue**—In wood preservation, the material remaining in the crucible on completion of the coke test.
- Test**—A test used to determine the amount of fixed carbon in bituminous materials.
- Tower**—A high tower or condenser filled with coke, used in the manufacture of hydrochloric acid to give a large surface for the union of a falling spray of water with the rising hydrochloric acid gas.
- Cokeite**—Natural coke formed by the action of magmas on coal, or by natural combustion of coal in mines.
- Colas**—This is another emulsion of asphalt in water. Soap is the emulsifying agent. The asphalt is a medium soft straight run Mexican asphalt. The manufacturers claim that when Colas breaks, the water and dissolved emulsifying agent run off or evaporate.
- Cold Cutter**—A cold chisel mounted on a handle like a hammer. It is used with the application of a maul.
- Drawn**—Usually applied to wire. Drawing is done by pulling the wire through a die or dies, thereby reducing it from a rod to desired sizes, at the same time increasing yield point, increasing smoothness. Most drawing of steel is done cold.
- Hammering**—The act or practice of hammering metal when cold.
- Laid Mixtures**—Plant mixes which may be spread and compacted at normal atmospheric temperature. They are prepared with liquid types of bituminous materials or with bituminous cements or powdered asphalt added to a mineral aggregate first coated with a volatile petroleum distillate or a flux oil in the case of asphalt, or with naphtha distillates in the case of tar. Most patented pavements are of the cold-laid type.
- Mix**—A general term for cold-laid asphaltic or tar concrete paving compositions with or without a petroleum solvent that can be handled and constructed at the prevailing seasonal temperature down to an air temperature of 45 deg. F., without application of heat greater than 125 deg. F.
- Pressed**—Pressed when cold. Applied generally to iron or steel.
- Rolled**—Rolled when cold. Applied generally to iron or steel. (See hot-rolled.)
- Short**—The condition of brittleness in steel when it is cold; caused by excessive phosphorus.
- Shut**—The freezing over of the top surface of an ingot before the mould has been filled, due to an interruption of the stream of molten metal.
- Straightening**—The process of straightening metal when cold.
- Test**—A name given to a test applied to lubricating oils in order

to ascertain their power of withstanding low temperatures without solidifying or depositing paraffin.

**Collar**—In welding, the excess metal of a completed fusion thermit weld.

—In engineering, a flange or projection encircling a pipe or culvert to hinder the seepage or flow of water along the pipe or structure.

**Collateral Trust Bonds**—When bonds are secured by a lien on other securities deposited with a trustee, they are called collateral trust bonds.

**Collecting System**—(See sewerage system.)

**Collier**—Vessel designed to carry coal, also used in carrying ore and other bulk commodities.

**Colligative Property**—In chemistry, a property numerically the same for a group of substances, independent of their chemical nature.

**Collimate**—To bring into line, as the axes of two lenses or of two telescopes; also to make parallel, as refracted or reflected rays.

**Collimating Marks**—(photographic mapping) Index marks to define the x and y coordinate axes and the principal point of the photograph. These marks are registered on the negative either by metal points in the frame of the camera or by marks engraved on the pressure plate.

**Collimation Position**—The ideal position of the line of sight of a telescope; that is, the optical axis. See, also, Line of Sight.

**Collimator**—A telescope, often without an eye-piece, which defines a fixed line of sight; used for adjusting transits and levels. The cross-hairs, ruled lines, or other marks, are set in the principal focal plane of the objective so that the rays from these marks emerge from the objective in a parallel beam. The telescope of the transit or level, when sighting into the

collimator, must be focused for long distance. The collimator point is then optically equivalent to a point at an infinite distance.

—**Vertical**—An instrument in which the telescope sights vertically (upward or downward); used chiefly for centering a theodolite on a tower exactly over a station mark on the ground. It may be used for any vertical sight.

**Collodion**—In electricity, an insulating and moisture-proof material used as a binder for windings.

**Colloid**—A state of matter supposed to represent a degree of subdivision into almost molecular dimensions, dispersed in a solvent. Colloidal particles possess the property of carrying electric charges, and also of failing to diffuse through a membrane, this being the original distinction between colloids and crystalloids.

—In soil stabilization, colloidal material is that material smaller than 0.001 millimeter in diameter.

**Colloidal Matter**—Suspended matter which is so finely divided that it is no longer acted on by gravity, and remains suspended indefinitely, yet will not pass through a parchment membrane in the ordinary process of dialysis.

—**Solids** (sewerage)—Extremely finely divided suspended material, which will not settle, and cannot be removed by the usual laboratory filtering.

**Colluvial**—Consisting of alluvium in part and also containing angular fragments of the original rocks.

**Colonnade**—In architecture, a series of columns.\*

**Color**—A generic term referring inclusively to all of the colors of the spectrum, white and black, and all tints, shades and hues which may be produced by their admixtures.

**Colprovia**—The Colprovia process consists of coating the aggregate with non-volatile prepared asphaltic softening medium in a twin-

shaft pug-mill or other suitable mixer and then introducing a hard asphalt in powdered form which forms a film over the particles to prevent their sticking together. The proportions of flux oil and powdered asphalt may be varied to produce any penetration cement commonly used.

**Column**—An upright compression member the length of which exceeds three times its least lateral dimension.

—In architecture, a supporting member usually consisting of a base, shaft and capital.

—**Box**—A column made in the shape of a box, having sides of steel plates united by angles.

—**Capital**—An enlargement of the upper end of the column built to act as a unit with the column and flat slab.

—**Composite**—A circumferentially reinforced concrete column with a core of structural steel or cast iron, each of which is designed to carry a portion of the load. Sometimes called combination column.

—**Control**—(See control column.)

—**Phoenix**—A fabricated column made up of rolled steel segments riveted together forming a circular section with either four or six exterior projections through which the rivets pass.

—**Pin-end**—A column that is free to turn at either end about a pin.

—**Spandrel**—A column resting on the extrados of an arch and supporting the roadway above.

—**Strip**—That quarter portion of a panel of a flat slab bounded by a plane through the center lines of columns or of wall bearings and a plane passing through the quarter points of the span.

**Columnar Structure**—In geology, the contraction phenomenon in which prismatic columns commonly with six uniform faces form on the cooling of magma.

**Coma**—An aberration of lenses, occurring in the case of oblique incidence, similar to spherical aberration of the axial rays. The image of a point is comet-shaped, hence the name.

**Comagmatic**—Having certain chemical or mineral characters in common and hence regarded as derived from a common parent magma; consanguineous; said of igneous rocks in a district or region, but not necessarily including all igneous rocks of the district.

**Combination Gas**—Natural gas rich in oil vapors. Wet gas. Also called casing-head gas.

**Combined** (drain or sewer)—A sewer carrying both storm water and sanitary sewage.

—**System** (sewerage)—A system of sewers, in which sewage and storm water are carried in the same conduits.

**Combining Volumes, Gay-Lussac's Law of**—(See Gay-Lussac's law of combining volumes.)

—**Weight**—Of an element or radical is its atomic weight divided by its valence.

**Combustion, Heat of**—(See heat of combustion.)

**Comealong**—An easily detachable tool for catching hold of a rope anywhere for pulling it. Used for pulling up guys, suspended cables, etc.

**Commercial Iron**—The element iron as pure as it is commercially produced.

**Common Return**—In electricity, a single wire which serves as the return path for a number of D.C. circuits.

**Common Sewer**—A sewer in which all abutments have equal rights of entrance and use.

—**Stock**—Common stock is evidence of a part ownership in the corporation and represents what might well be termed a last call on the income of the company. After payment of expenses, taxes,

- bond interest, and preferred stock dividends, the remainder is available for common stock dividends.
- Commutator**—In electricity, the device for changing the direction of an electric current.
- Two-Part**—(See two-part commutator.)
- Commutated Current**—In electricity, a current that has been rectified by a commutator.
- Comparator**—In photographic mapping, a comparator is a device for measuring accurately the two rectangular coordinates of the image of a point on a photograph.
- Base**—A carefully measured horizontal distance, usually one tape-length long, used as a means of checking and comparing the tapes used in the field.
- Compass**—An instrument for determining directions, usually by the pointing of a magnetic needle free to turn in a horizontal plane, as for example, the ordinary surveyors' compass, though sometimes having a clinometer attached.
- Dipping**—(See dipping compass.)
- Compliance, Acoustic**—(See acoustic compliance.)
- Component**—One of the independently variable constituents of a system.
- A constituent part. One of the parts into which forces or stresses may be resolved or divided.
- Horizontal**—A component of an oblique force taken in a horizontal line.
- Longitudinal**—A component in a direction parallel to the plane of the trusses.
- N<sub>2</sub>**—The tidal component which takes account of the moon's perigean movement.
- Tide**—Each of the simple tides into which the tide of nature is resolved.
- Transverse**—A component in a transverse direction generally intended for a component perpendicular to the plane of the trusses.
- Components K and O**—The tidal components which take account of the moon's changing declination. The periods of the two components are such that at maximum declination the components are at a maximum and when the moon is on the equator they neutralize each other.
- Composite**—In architecture, an order of architecture originated by the Romans, with the upper part of the capital composed of Ionic details, and the lower part composed of Corinthian details.\*
- Dike**—A dike of igneous material formed by two intrusions of different ages which have entered the same fissure.
- Structure**—In welding, a structure wherein more than one method of joining its parts is used.
- Composition Metal**—A yellow alloy of copper, zinc, etc., used for sheathing vessels.
- Compound Fissure**—In railway use, a horizontal split head in a rail which, in developing, extends into a plane other than horizontal.
- Cross** (steam engine—crank and flywheel only)—A steam end having a high and low pressure steam cylinder arranged side by side with cranks 90 deg. apart.
- Tandem** (steam engine)—A steam end having a high and a low pressure steam cylinder arranged on the same longitudinal or vertical center line.
- Compressibility**—Reciprocal of the bulk modulus.
- Compression Efficiency** (for compressors)—The ratio of the theoretical power required to compress the amount of air or gas actually delivered to the actual power required in the compressor cylinder as shown by indicator diagrams.
- Ratio**—The ratio of the volume of the gas in an engine cylinder at the beginning of the compression stroke to its volume at the end of the stroke.

—**Wing Rib**—A heavy rib designed to perform the function of an ordinary wing rib and also to act as a strut opposing the pull of the wires in the internal drag truss.

**Compression-Ignition Engine** — A type of engine in which the fuel is sprayed into the cylinder and ignited by the heat of compression of the air charge.

**Compressive Stress**—A stress which resists the shortening effect of an external compressive force.

**Compressor**—A machine designed for densifying air or gas from an initial intake pressure to a higher discharge pressure.

—**Capacity**—(See capacity, compressor, actual.)

**Computations**—Calculations; the figuring of engineering structures.

**Concave Bank**—The concave bank of a river has the center of the curve toward the channel.

**Concentrated Sewage**—A relative term. Sewage containing a relatively large quantity of organic matter.

**Concentration**—A system of loading in which several loads are collected and applied at a point or over a very small area.

**Concentric Strand** (wire rope)—A single strand of round wires symmetrically arranged.

**Conchoidal**—Shell-shaped. The more compact rocks such as flint, argillite, felsite, etc., break with concave and convex surfaces and are therefore said to have conchoidal fracture.

—**Fracture** (of a mineral)—A fracture presenting a shelly surface.

**Concluded Angle** — (triangulation) The third angle of a triangle, not measured, but calculated from the other two angles.

**Concourse, Passenger**—The area adjacent to and on the waiting-room side of the train gates provided for the assembling and dispersal of the traveling public.



*Photo courtesy The Asphalt Institute  
Spreading bituminous concrete mixture as resurfacing over Portland cement concrete pavement*

—**Train**—An auxiliary area on the platform side of the train gates connecting the platforms.

**Concrete** (Portland cement)—A suitable mixture of Portland cement, mineral aggregates and water, hardened by hydraulic chemical reaction.

—(bituminous)—Consists usually of a bituminous cement with broken stone, slag or gravel with sand and a mineral filler. The mixture is commonly prepared at a stationary plant, and may be either a hot or cold mix.

**Concretion**—A spheroidal or discoidal aggregate formed by the segregation and precipitation of some soluble material like quartz or calcite around a nucleus, which is often a fossil.

—**Rigid**—(See rigid conduit.)

**Concurrent Forces**—Forces in which the lines of action intersect in a common point.

**Condenser Charge**—In electricity, that electrostatic charge of a condenser in coulombs.

—**Dielectric**—In electricity, the insulation between the plates of a condenser.

—**Variable** (electric)—(See variable condenser.)

**Conductive**—In electricity, capable of conducting a current.

**Conductor**—In electricity, that sub-

stance which will permit the passage of an electric current.

**Conductor, Active** (in electricity)—(See active conductor.)

**Conduit**—A general term including canals, ditches, flumes, pipes, or any other means or devices for the conveyance of water or liquids, gases, and even wires when placed underground.

**Cone**—In welding, that part of the welding flame which is conical in shape and lies next to the orifice of the tip. This is the hottest part of the flame.

**Cone-in-Cone**—A curious structure, occasionally found in clay rocks, whereby two opposing and interlocking sets of cones or pyramids are developed with their axes parallel and their bases in approximately parallel surfaces.

**Conformable**—When beds or strata lie upon one another in unbroken and parallel order, and this arrangement shows that no disturbance or denudation has taken place at the locality while their deposition was going on, they are said to be conformable.

**Conglomerates**—Consist of pebbles of various sizes, intermixed with a finer material which acts as a cement. The pebbles may vary in size from a small pea to large boulders, and all are well rounded by water action.

**Congruent**—A compound is said to melt congruently when at some temperature it is in equilibrium with a liquid of its own composition.

**Conical Drum**—The drum of a winding engine, constructed in the form of two truncated cones placed base to base, the outer ends being usually the smaller in diameter. It may also be a single cone.

**Coning Angle**—The average angle between the span axis of a blade or wing of a rotary wing system and a plane perpendicular to the axis of rotation.

**Connate Water**—Water which was deposited simultaneously with the deposition of solid sediments, and which has not since its deposition existed as surface water or atmospheric moisture.

**Conjugate Center**—(aerial photography) The image point on a photograph of the principal point of an adjacent overlapping photograph.

**Consanguinity**—A word used to describe the genetic relationship of those igneous rocks which are presumably derived from a common magma.

**Consecutive Digestion**—Digestion of sewage solids under thermophilic conditions, followed by digestion and concentration of sludge under mesophilic conditions.

**Consertal**—The texture in an igneous rock caused by irregularly shaped crystals, closely fitted together.

**Conservation of Energy**—In every modification of a material system not affected by forces foreign to the system the sum of its potential and kinetic energies remains constant.

**Consistency** (of Portland cement concrete)—Is a general term relating to the character of the mix with respect to its state of fluidity. Consistency embraces the entire range of fluidity from the driest to the wettest possible mixtures and requires a qualifying term for definiteness.

—The degree of solidity or fluidity of bituminous or other materials.

**Console**—In architecture, an ornamental bracket.\*

**Consolidated Mortgage Bonds**—Consolidated mortgage bonds usually represent a mortgage on all properties of several subsidiary companies which have been consolidated.

**Constant Resistance Structure**—In acoustics, a constant resistance structure whose iterative impedance in at least one direction is a pure

resistance and is independent of the frequency.

**Constitutive Property**—In chemistry, a property which depends on the constitution or structure of the molecule.

**Construction Joint**—A plane of separation in a structure made necessary by the exigencies of construction.

—No allowance is made for expansion or contraction.

—**New**—(See new construction.)

—**Station**—A distance of 100 ft. measured along the center line and designated by a stake bearing its number.

**Consumptive Use**—Water used by transpiration and evaporation in the production of crops.

**Contact**—The place or surface where two different kinds of rocks come together.

—**Aerator** (sewage)—A device consisting of a crate holding broken stone, coke, brushwood, or other media, which is placed in a single or two-story sedimentation tank and through which the sewage is made to flow upwards and return on the outside and become activated by the admission of compressed air below.

—**Bed**—A water-tight basin filled with coarse material, such as broken stone, in contact with which the sewage is for a time held by control of the underdrains—the cycle of operation involving periods of filling, standing full, emptying and resting empty—so regulated as to secure such contact with the bacterial films adhering to the surface of the coarse material, and such aeration of the bacterial surfaces as may be required to oxidize the sewage.

—**Breaker**—In electricity, a circuit breaker.

—**Deposit**—A mineral deposit usually found at or within 300 meters of an igneous intrusion and the country rock, whether that country

rock be igneous, metamorphic or sedimentary. The intrusion and the country rock may be the same rock family, perhaps even the same species.

—**Metamorphism**—A general term applied to the changes which take place along a contact (of an intruded igneous rock into which it has been thrust), such as recrystallization of limestone, or the formation of the typical silicate minerals. Metamorphism produced by the heat of an igneous intrusion.

**Contamination**—The introduction into a water of bacteria or other substances which tend to render it unsuitable for any given use.

**Continental Deposits**—Sedimentary deposits laid down within a general land area and deposited in lakes or streams or by the wind, as contrasted with marine deposits laid down in the sea.

—**Glacier**—A type of glacier covering an entire continent, or a large portion of it; an ice sheet, as the ice cap of Greenland.

**Contingencies**—In engineering economics, unforeseen expenses.

**Continuity**—In welding, the linear distribution of a weld in a welded joint.

**Continuous Beam**—(See beam, continuous.)

—**Current**—In electricity, that current which flows in one direction only.

—**Girder**—(See girder, continuous.)

—**Plant** (water treatment)—A plant so designed that the untreated water may be pumped to it without interruption and where the volume of the chambers through which it passes before flowing to storage is sufficient for complete reaction and precipitation.

—**Stave Pipe**—A pipe of wooden staves held together by encircling bands, the assembly of which is made in the field.

—**Stringer**—A stringer that extends over two or more panels.

- Truss**—A truss which extends over three or more supports.
- Continuous-flow Irrigation**—A system by which each irrigator receives his allotted quantity of water at a continuous rate.
- Contour**—An imaginary line on the surface of the ground, every point of which is at the same altitude.
- Checks**—In soil conservation, compartments of a field made by borders following the contours; a form terracing.
- Interval**—The vertical distance between the contour lines on a map.
- Line**—A level line connecting points on the surface of the earth having the same elevation; also, its representation on a map. It is the line of intersection of a level surface with the surface of the ground; as, for example, a shore line. Contour lines form closed loops which may or may not appear entirely within the limits of the map.
- Contours, Loudness**—(See loudness contours.)
- Contract**—A written agreement between two or more parties specifying terms, conditions, etc., under which certain obligations must be performed. (Specifications are a part of the contract.)
- Contracted Weir**—A measuring notch with sides designed to produce a contraction in the area of the over-flowing water.
- Contraction**—(hydraulics) The decreased cross-sectional area of a jet or nappe after passing an orifice, weir, or notch. (See also Vena Contracta.)
- Joint**—(See expansion joint.)
- In Portland cement concrete pavement, a joint or plane of weakness at which movement due to the contraction of adjacent masses is localized.
- Contraflexure**—A reversal of bending in a column or beam.
- Control**—Points on the ground, accurately fixed in position horizontally or vertically (or both), which are used as accurate starting and closing points for traverses, plane-table surveys, terrestrial or aerial photographic surveys, etc. A system of control points is usually established by triangulation or traverses, and by leveling. Cadastral Control—The established monuments whose positions are used in all correlated cadastral surveys.
- A cross-section of a conduit where conditions exist that determine the regimen of flow up stream independent of the conditions down stream.
- Cable**—The line of wire or stranded cable leading from the control levers to the control surfaces or interconnecting the control surfaces.
- Column**—A lever having a rotatable wheel mounted at its upper end for operating the longitudinal and lateral control surfaces of an airplane. This type of control is called "wheel control."
- Flume**—A measuring flume consisting of a short section of artificial channel in which the flowing water is caused to pass through Belangor's critical velocity by restriction of the channel cross section.
- Line**—One of the lines leading from the control car or compartment to the various parts of an airship and operating (either through mechanisms or directly) the rudders, valves, etc., which control the speed, altitude, etc., of the airship.
- Servo**—A control devised to reinforce the pilot's effort by an aerodynamic or mechanical relay.
- Stick**—The vertical lever by means of which the longitudinal and lateral control surfaces of an airplane are operated. The elevator is operated by a fore-and-aft movement

of the stick; the ailerons, by a side-to-side movement.

—**Surface**—A movable airfoil designed to be rotated or otherwise moved by the pilot in order to change the attitude of the aircraft.

**Controllable Propeller**—A propeller whose blades are so mounted that the pitch may be changed while the propeller is rotating.

**Controllability**—The quality of an aircraft that determines the ease of operating its controls and/or the effectiveness of displacement of the controls in producing change in its attitude in flight.

**Controls**—A general term applied to the means provided to enable the pilot to control the speed, direction of flight, attitude, power, etc., of an aircraft.

**Control-Surface Area, Trailing**—The area of a trailing control surface is the area of the actual outline projected on the plane of the surface, except that any portion of the movable surface lying forward of the hinge axis and within the fixed surface is included in the fixed surface. Auxiliary or paddle-type balance surfaces shielded by and lying outside of the fixed surface are not included in the area of either the fixed or the movable surfaces.

**Convenient Sign**—A symbol, such as a mark, character, abbreviation or letter, selected or sanctioned by general agreement or common use to indicate upon may or plan certain forms, conditions or objects, both natural and structural.

**Convergence of Terrestrial Meridians**—The angle between the meridians of two places.

—The difference in the azimuth or the bearing of a line, AB, as measured from the meridian through A and as referred to the meridian through B.

**Conversion (hydraulics)**—A short conduit for uniting two others hav-

ing different hydraulic elements; a transition.

**Converter**—Same as "Bessemer furnace."

**Converter, Cascade**—(See cascade converter.)

**Convertible Bond**—Evidence of a mortgage lien on a property, which may, under certain conditions, be exchanged for some other securities of the corporation. It is usually exchangeable for stock.

**Convex Bank**—The convex bank of a river has the center of the curve away from the channel.

**Conveyance Loss (irrigation)**—Loss of water from a conduit due to seepage, evaporation, or evapo-transpiration.

**Conveying Rope**—A wire rope, usually endless, used to move the carriers or any kind of receptacles on material conveyors.

**Conveyor**—A machine equipped with buckets or a belt to transfer materials.

—(See cableway.)

**Coordinates**—Linear or angular dimensions designating the position of a point in relation to a given reference frame. **Plane, or Rectangular Coordinates**—The perpendicular distances of a point from a pair of rectangular coordinate axes. **Geodetic Coordinates**—Latitude and longitude as calculated on the spheroid. **Astronomical Coordinates**—Latitude and longitude as observed astronomically. **Spherical Coordinates**—1. The linear distances along the circumferences of two great circles which are at right angles to each other, measured from the point where their circumferences intersect; one coordinate is measured along the circumference of the first great circle to the intersection of this circumference and a third great circle plane passing through the point and perpendicular to the first great circle, and the second coordinate is measured along the circumfer-

ence of the second great circle to the intersection of this circumference and a plane passing through the point and parallel to the plane of the first great circle. 2. Latitude and longitude; coordinates similar to those just described except that the reference figure is an ellipsoid of revolution (the earth) instead of a sphere. **Plate Coordinates**—(photographic mapping) Rectangular coordinates measured on a photograph with reference to the principal point as origin. **Space Coordinates**—(photographic mapping) The three coordinates of a point defining its horizontal position and elevation with reference to some system of ground coordinates.

**Cope**—To dress. To notch steel beams, channels, etc.

—**Chisel**—Same as "Cape chisel."

**Coping**—A top course of stone or concrete, generally slightly projecting, to shelter the masonry from the weather, or to distribute the pressure from exterior loading. A projecting covering or cap of a wall.

—**Machine**—A machine for notching structural shapes.

**Coppel Dust**—(See cupel dust.)

**Copper, Blanched**—(See blanching copper.)

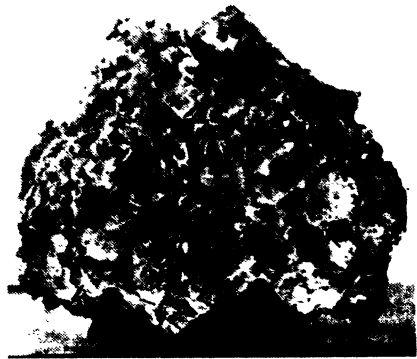
**Coprolite**—The fossilized excrement of fishes, reptiles, birds, and mammals.

**Coquina**—Consists essentially of marine shells which are held together by a little calcium carbonate cement so as to form a fairly firm rock. It is full of cavities but is strong enough for use in building operations. The classic example is the "coquina" of the east coast of Florida.

**Corbel**—A projecting beam acting as a cantilever supporting another beam.

**Cord, Rip**—(See rip cord.)

**Cordierite**—A magnesium-iron-alum-

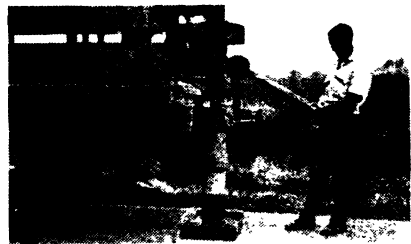


*Photo courtesy U. S. Bureau of Public Roads  
Coquina limestone*

inum silicate. Sometimes used as a gem.

**Core**—(See center.)

—**Drill**—A tube, rotated by outside power, with black diamond points or drill shot on the cutting end, used for removing cylindrical samples from pavements.



*Core drill*

—**Wall**—A wall of masonry, sheet piling, or puddled clay built inside a dam or embankment to reduce percolation.

**Corinthian**—In architecture, a classical order originated by the Greeks.\*

**Corner**—A point determined by the surveying process; usually at the intersection of two or more lines.

—**Bracket**—A steel bracket rigidly attached in a re-entrant corner of a structure.

- Post**—A post located at the intersection of two lines or sections of fence.
- An upright erected from a horizontal or inclined plane at the outer intersection of two vertical planes.
- Cornice**—The uppermost division of an entablature.\*
- Corona**—In architecture, an uppermost member of a cornice. It has a deep vertical face and wide horizontal projection. A drip molding is usually cut in the soffit near the vertical face to prevent water from following back and down on the frieze.\*
- Corrasion**—The mechanical detachment or wearing away of rock material by running water, glaciers, winds, waves, or mass movements; the effectiveness of these agencies being determined in part by the abundance and character of the abrading materials or tools they carry.
- Correction**—The amount to be added (algebraically) to any measured value to obtain the true value (or an improved value). The sign is opposite to that of the error. It is taken in the sense, correction = true value — measured value. Example: A distance taped at a temperature below standard (68° F.) with a tape having a positive coefficient of expansion requires that (say) 0.04 ft. be subtracted from the result of the measurement. The correction is, therefore, —0.04 ft. The error is + 0.04 ft. See, also, Error.
- Corroded Crystals**—Phenocrysts of crystals that after crystallization are more or less fused again into the magma.
- Corrosion**—The dissolving or eating away of the surface of metal through chemical action, either regularly and slowly as by rusting in air, or irregularly and rapidly as by pitting and grooving in the interior of boilers.
- Corrosive Sublimate**—Mercuric chloride.
- Corrugated**—Bent or drawn into parallel furrows or ridges. Wrinkled; fluted.
- Corrugation**—Regular undulations in the surface of metal or other material, consisting of alternate valleys and crests; in case of pipe these run circumferentially or helically around same.
- Cortlandite**—A name for a peridotite that consists chiefly of hornblende and olivine.
- Corundolite**—Rocks composed of corundum or emery.
- Corundum**—The name of this mineral is sometimes prefixed to the names of rocks containing it; as corundum-syenite; the mineral having the composition of  $Al_2O_3$ .
- Cost**—The outlay incurred in acquiring, creating, operating or maintaining a property, including the money value of the services rendered and other considerations involved. Also frequently used to denote the price that a purchaser has paid.
- Actual**—A real expenditure. It usually refers to the cost to the present owner.
- Average**—An appraisal term defined as the cost determined on the basis of average prices or costs at a given time, or the average of prices or costs over a period of time.
- Book**—An appraisal term defined as the cost as recorded upon the books.
- Direct**—An appraisal term defined as the cost of materials, labor, and other items that can be allocated to specific units of property.
- Direct Construction**—An appraisal term defined as the cost for materials, equipment, labor, and services directly involved in the construction of a physical property. Such costs may include required contractor's overhead and profit, liability and compensation insur-

ance during construction and architects' and engineers' fees. It does not include taxes, interest, fire, and other general insurance protection, legal expense, and administration expense during the process of construction.

**Cost, Historical**—An appraisal term defined as the actual or normal cost of a property in accordance with the market prices as of the date the various parts were first constructed or placed in service.

—**Indirect**—An appraisal term defined as the indirect construction cost and cost of financing, promotion, organization, attracting customers, and other necessary expenditures to develop a property and attach a going business.

—**Indirect Construction**—An appraisal term defined as the cost indirectly involved in the construction and equipment of physical property (usually fixed assets), such as taxes, interest, general insurance, legal expense, and other expenditures necessary during a normal period of construction.

—**Keeping**—The recording of the expenditures made in doing work for the purpose of having knowledge of the progressive expenditures on the project, if desired and of the total expenditure when completed, and in such units as may be established. Fundamentals for this purpose require that there be an accurate record of all the units of material and their costs, with all the costs for applying such material, with proper credits, if any, for material salvaged.

—**Original**—An appraisal term defined as the actual cost of a property to the present or a prior owner, not necessarily the first cost as of the date of construction.

—**Of Production**—In economics, this term refers to money outlays, debits incurred, proprietary losses of normal income, and compensation for risks involved in production.

—**Of Replacement**—An appraisal term defined as the normal cost of duplication with a property of equal utility and desirability; frequently used as synonymous with "cost of reproduction new" and, where so used, should be specifically defined since it has a more limited meaning.

—**Of Reproduction**—In engineering economics, the present cost of a plant, or unit, regarded as reproduced new at present prices.

—**Of Reproduction Less Depreciation**—An appraisal term defined as the amount resulting from the deduction of the "accrued depreciation" from the "cost of reproduction new"; usually refers to the results of an appraisal based upon personal inspection, calculated costs of reproduction, and observed depreciation.

—**Of Reproduction New**—An appraisal term defined as the normal cost of duplication with new items of the same or equivalent material or type in accordance with the market conditions of a specified date or period; a broader term than "replacement cost."

—**Spot Reproduction**—An appraisal term applied to designate the establishing of unit prices in an appraisal inventory, based upon materials and labor prices prevailing on an exact certain date, as distinguished from "period prices" or other "trend" considerations.

—**Trended**—An appraisal term applied, particularly in public utility rate making procedure, to the application of "index figures" to original, historical or appraised costs for the purpose of estimating the normal cost as of another date under similar conditions of acquisition, construction, and installation.

**Cotter**—A beveled piece of wood or steel, used as a wedge for fastening. Also a split steel key, used for the same purpose.

**Cotton Rock**—A local name for the

soft, fine-grained siliceous magnesian limestone of the lower Silurian.

**Counter**—An adjustable diagonal in a truss not subjected to stress except for certain partial applications of live load.

—**Shear**—A shear in opposition to another shear.

—**Stress**—A stress in the web member of a truss which occurs for certain positions of the live load and is the reverse of the usual stress in the member or panel.

**Counterbore**—The re boring of a cylindrical hold for a part of its length to a larger diameter than the original.

**Counterbrace**—A web diagonal which transmits a stress in the opposite direction (in relation to span length) to that carried by the main diagonal of the same panel.

**Counterfort**—A projection on the tension side of a wall, designed to strengthen wall and resist overturning.

**Counterforted Retaining Wall**—A reinforced concrete wall with brackets or counterforts on the tension face uniting the upright section to the heel of the base.

**Countersink**—To cut away material from the edge of a hole in such manner that the head of a screw, rivet or bolt will be flush with the surface.

**Countersinking Reamer**—A bit with a conical shaped head used for countersinking holes.

**Counterweight**—A weight that counter balances some other weight. To weight against.

—**Rope**—A wire rope used for supporting and traveling the counterweight on elevators or other machinery.

**Country Rock**—A purely relative term used for the older rock into which the magma has intruded.

**Couple**—Two equal and parallel forces acting in opposite directions

and in different lines. (See force couple.)

—**Moment of**—The tendency of a couple to produce rotation, measured by the product of one of the two equal forces by the perpendicular distance between them.

—**Stress**—A pair of equal and opposite stresses lying in the same plane.

**Coupler**—In railroad use, the device by means of which any railway car or machine to be towed is connected to the towing agency. Coupler includes draw head, and coupler links and pins, or other device for connecting two draw heads.

—**Drawbar**—The portion of a railroad car coupler used to connect the draw heads of two cars or other units of railroad roadway machinery.

—**Drawhead**—That portion of a railroad car coupler that is rigidly attached to railway motor car, trailer or unit of roadway machinery designed to be towed.

**Coupons**—Every bond (with the exception of temporary bonds, income bonds, and fully registered bonds) has attached to it a sheet of coupons. These are a definite promise to pay the bearer a fixed amount of interest on certain dates.

**Course**—One or more layers of road metal spread and compacted separately for the formation of the road or pavement. Courses are usually referred to in the order of their laying, as first course, second course, third course, etc. Also a single row of blocks in a pavement.

—Each separate horizontal layer or tier in concrete, stone, or brick masonry. "Coursed masonry" is built up in courses with continuous bed joints.

—**Bed**—Stone, brick or other building material in position, upon which other material is to be laid.

—**Light**—A light projected along the course of an airway so as to be

visible chiefly from points on or near the airway.

**Coursed Rubble**—Rubble in courses of differing breadths.

**Coursing**—Ventilation in mines, as by doors, brattices and stoppings.

**Courtzilite**—A form of asphaltum allied to gilsonite.

**Cove**—The line of intersection between two surfaces of a hull, the vertex of the angle of intersection pointing inward.

**Covellite**—A cupric sulphide mineral,  $\text{CuS}$ , containing about 34 per cent sulphur and 66 per cent copper.

**Cover Crop**—Any vegetable, hay, or other crop that is planted to be plowed under to improve the soil and add plant food.

—**Plate**—(See plate, cover).

**Cover-stones**—The flat stones forming the roof of a stone box culvert.

**Cowling**—A removable covering.

—**Ring**—(See ring cowling.)

**C.P.**—(See coarse pointed.)

**Crab**—A short shaft or axle, mounted in a frame, having squared ends to receive hand cranks, used to wind up rope and thereby raise a load.

—A winch on a movable frame with power gearing, used in connection with derricks and other non-permanent hoisting-machines.

—**Derrick**—A hoisting apparatus at the foot of a derrick.

**Crack**—Fissure or open seam not necessarily extending through body of material.

**Cracks**—Cracks in structures are of several kinds, depending upon the location and cause. Below are given some of the different types: (a) structural cracks; (b) shrinkage cracks; (c) checking; (d) map cracking.

**Cracking, Map**—Refers to a type of crack which resembles the irregular boundary lines of political subdivisions on a map.

—**Shrinkage**—Occur in a structure due to the normal shrinkage which may be expected of concrete.

Their location, distribution, and size are determined by the amount and distribution of the reinforcement, size and arrangement of members, and the character of the concrete.

—**Structural**—Is in some way related to the structural service. It may be the result of excessive stresses due to inadequate reinforcement, overloading, settlement, or some extraneous force not anticipated in the design.

**Cradle**—A special foundation built to fit the bottom of a conduit and to distribute the vertical loading over a wider area.

—A structure riding on an inclined track on the river bank and having a horizontal deck with track thereon for transfer of railroad cars to and from boats at different elevations of water level, generally found on rivers.

—To incline suspending bridge cables to the vertical.

—**Apron**—Sloping nose on river car ferry which rides under apron girders, forming outer end of a cradle when ferry is landing against cradle. (Used on Mississippi River System.)

—**Girders**—Structural members attached to cradle spanning distance between car ferry and cradle. When not resting on cradle apron they ride on a truck which is attached to cradle and which runs on the incline track. (Used on Mississippi River System.)

**Cradling**—The placing of the cables in a suspension bridge so that they are closer at the sag than at the supporting towers.

**Cramp**—A bar of metal having the two ends bent at right angles to the bar for insertion into holes drilled in adjoining blocks of stone.

**Crampon**—A form of hooked clutch or dog for raising stones, lumber, ice, etc.

**Crandall**—A stone dressing hammer, consisting of a steel bar with a

slot in one end holding 10 double-headed points of steel, producing an effect like fine pointing.

**Crane**—A hoisting machine mounted so that it can move in a horizontal direction and thereby place the load at any point within the range of its boom.

—**Crawler**—A revolving self-propelling wheel track equipped with treads in place of wheels. Used on power shovels, cranes, tractors, etc., to reduce load pressure per square inch on soil over which traveling.

—**Derrick**—A crane in which the post is supported by fixed stays in the rear, the jib being pivoted like the boom of a derrick.

—**Girder**—A girder either stationary or movable, on which a hoisting crane operates.

—**Jib**—A crane having a swinging boom.

—**Ladle**—A pot or ladle, supported by a chain from a crane, used for pouring molten metals into molds.

**Crank and Flywheel Pump**—A steam driven reciprocating pump with crankshaft on which a flywheel is mounted for storing energy during the early part of the stroke and imparting this stored energy to the liquid piston or plunger during the latter part of the stroke, after the steam is cut off in the steam cylinder. The length of the stroke is determined by the throw of the main crank.

**Crater**—In welding, a convex depression in the fusion area of a weld indicating the depth of fusion.

**Crazing**—Is a term applied to map cracking of very small pattern.

**Creep**—A slow, natural downward movement of loose material on hillsides.

—(See flow.)

**Creeper, Ice**—(See ice creeper.)

—**Traveler**—A small movable derrick running on a track on the upper chord of a truss. It usually has two booms.

**Creosote Coal-tar Solution**—In wood

preserving, solution of coal tar in creosote in various proportions. Usually contains 20 to 40 per cent of coal tar.

—**Oil**—As used in wood preserving, creosote is a distillate of coal tar produced by high-temperature carbonization of bituminous coal; it consists principally of liquid and solid aromatic hydrocarbons, and contains appreciable quantities of tar acids and tar bases; it is heavier than water; and has a continuous boiling range of at least 125 deg. C. beginning at about 200 deg. C.

**Crescent Truss**—A truss with both chords curved upward, or both downward, and making sharp intersections with each other at the ends, producing in outline the appearance of a crescent, the web system being of the triangular.

**Crest**—The top of a dam, dike, spillway, or weir; frequently restricted to the overflow portion. The summit of a wave. Peak of a flood.

**Cretaceous**—(Of the nature of chalk, relating to chalk; the third and latest of the periods included in the Mesozoic era; also the system of strata deposited in the Cretaceous period.

**Crevasse**—A breach in a levee or river embankment.

**Crew, Landing** (or ground)—A detail of men necessary for the landing and handling of an airship on the ground.

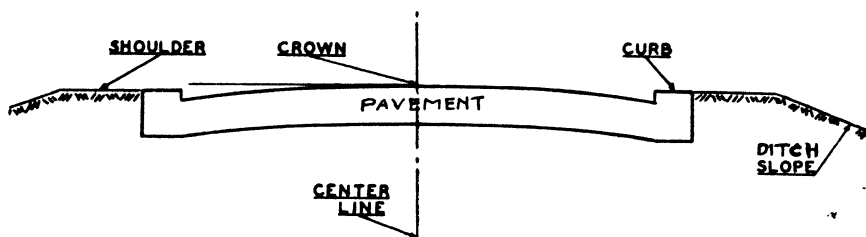
**Crib**—In railway use, that portion of the ballast between two adjacent ties.

—**Dam**—In soil conservation, a barrier made of timber, forming bays or cells which are filled with stone or other suitable material.

**Cribwall**—A wall revetment built by crossing timbers or precast concrete members in tiers in the form of a square with a hollow center.

**Crimp**—To offset a structural angle by bending so that it will fit over the flange of another angle, thus

- doing away with filler plates beneath.
- Crimping Machine**—A machine which crimps angles. Used in bridge shops.
- Critical Altitude**—The maximum altitude at which a supercharger can maintain a pressure in the intake manifold of an engine equal to that existing during normal operation at rated power and speed at sea level.
- Angle of Attack**—The angle of attack at which the flow about an airfoil changes abruptly as shown by corresponding abrupt changes in the lift and drag.
- (hydraulics)—The depth of water in a channel corresponding to critical velocity. A given quantity of water in an open conduit may flow at two depths having the same energy head. When these depths coincide, the energy head is a minimum and the corresponding depth is Unwin's critical depth.
- (hydraulics)—(1) Reynold's critical velocity is that at which flow changes from stream-line to sinuous or turbulent and where friction ceases to be proportional to the first power of the velocity and becomes proportional to a higher power of the velocity; (2) Kennedy's critical velocity is that in open channels, which will neither pick up nor deposit silt; (3) Unwin's critical velocity is that in open conduits for which the velocity head equals one-half the mean depth, and for which the energy head is a minimum.
- Critical Depth** (hydraulics) — The depth of water in a channel corresponding to one of the recognized critical velocities. Ordinarily used in reference to Belanger's critical depth, which is the depth at which a given flow would attain its minimum energy with respect to the bottom of the channel.
- Flow** (hydraulics)—A condition of flow for which the mean velocity is at one of the critical values; ordinarily flow at Belanger's critical depth and velocity. Another important usage is in reference to Reynold's critical velocities in which the point at which the flow changes from stream line or non-turbulent flow to turbulent flow.
- The maximum discharge of a conduit which has a free outlet or get-away and has the water ponded at the inlet.
- Moisture**—In soil technology, the deformations of either confined or unconfined soil samples under constant load increase with increase of moisture content at a consistent rate until a given moisture content known as the critical moisture is reached.
- Slope**—The minimum slope of a conduit which will produce critical flow.
- Speed**—That speed of a train on a bridge which produces the maximum impact.
- Temperatures**—Temperatures at which, during heating or cooling, marked internal crystalline or molecular transformations occur in iron or steel, resulting in the absorption or evolution of heat and alterations in the physical properties of the material.
- Velocity** (hydraulics)—The velocity at which occurs some basic change in the nature or effect of flow. There are several such "critical" velocities. The term is most commonly used in reference to Belanger's critical velocity, or that velocity at which the energy of the flowing liquid touches its minimum possible value.
- Crocidolite**—An asbestos-like silicate of the amphibole group, containing silica, iron, and soda.
- Crocus**—A term used in some quarries to denote gneiss or any other rock in contact with granite.
- Crook** (lumber)—A deviation edge-wise from a straight line drawn from end to end of a piece of



*Cross-section of a paved highway*

lumber, and is measured at the point of greatest distance from the straight line.

**Crop Coal**—Coal of inferior quality near the surface.

**Crop End**—A piece cut from the end of a bloom or rail during manufacture.

**Cropping**—The act of shearing or sawing off a certain amount of metal from the end of the bloom after being rolled from an ingot, or from the end of a rail after it is finished.

**Cross Bracing**—Same as "X bracing."

—**Entry**—An entry running at an angle with the main entry.

—**Frog**—A frog adapted for railroad tracks that cross at right angles.

—**Girder**—Any girder passing across a bridge from one truss or main girder to another, and generally, perpendicular to the truss or girder planes.

**Cross Section**—A vertical section of the ground or a structure at right angles to the center line.

—A vertical section of the surface of the ground, or of underlying strata, or both, taken at right angles to the center line or across a stream.

—A horizontal grid system laid out on the ground for determining contours, quantities of earthwork, etc., by means of elevations of the grid points.

—A design drawing showing unit dimensions, taken at right angles to the center line, or to some particular axis.

—**Balanced**—(See balanced cross-section.)

—**Unbalanced**—(See unbalanced cross-section.)

**Cross-bedding**—Laminations, in sedimentary rocks, confined to single beds and inclined to the general stratification. Caused by swift, local currents, deltas, or swirling wind-gusts, and especially characteristic of sandstones, both aqueous and eolian.

**Cross-grained Wood**—Wood in which the fibers are not parallel with the axis of a piece.

**Cross-Wind Force**—The component perpendicular to the lift and to the drag of the total air force on a body.

**Crossing** (track)—In railway use, a structure, used where one track crosses another at grade, and consisting of four connected frogs.

**Crossover**—In railway use, two turnouts with the track between the frogs arranged to form a continuous passage between two nearby and generally parallel tracks.

—**Double, or Scissors**—Two crossovers which intersect between the connected tracks.

**Crosswalk**—That portion of a roadway ordinarily included within the prolongation or connection of the lateral lines of sidewalks at intersections; any portion of a roadway distinctly indicated for pedestrian crossing by lines or other markings on the surface.

**Crown**—The highest point of an arch rib or ring.

—The higher part of the curved sur-

face of a road. Often used to designate the difference in elevation of the highest point of a roadway and the edge of the traveled way.

—**Highest point on a cross-section**, usually the center.

—The inside top of a sewer.

**Crown-Gate**—The head gate of a canal lock.

**Crowsfoot**—(1) A system of diverging short ropes for distributing the pull of a single rope. (2) An arrangement in which the strands of a cord are opened out so that they can be effectively cemented to a fabric surface.

**Cruciform Girder**—The structure, consisting of vertical and horizontal transverse girders, fitted at the stern of a rigid airship for the purpose of supporting the inboard ends of the sternposts of the fins or of the rudder posts.

**Crude Petroleum**—A naturally occurring mixture, consisting predominantly of hydrocarbons, and/or of sulphur, nitrogen and/or oxygen derivatives of hydrocarbons, which is removed from the earth in liquid state or is capable of being so removed.

—**Sewage**—Sewage which has received no treatment.

—**Shale Oil**—The oil obtained as a distillate by the destructive distillation of oil shale.

**Crush-Border**—A microscopic granular structure sometimes characterizing adjacent feldspar particles in granite in consequence of their having been crushed together during or subsequent to their crystallization.

**Crushed Gravel**—The product resulting from the artificial crushing of gravel with substantially all fragments having at least one face resulting from fracture.

—**Gypsum**—Gypsum subjected to a primary crushing operation.

—**Head**—A "flattening" of the head of a rail usually accompanied by a crushing down of the metal with-

out any indication of a crack on the underside of the head.

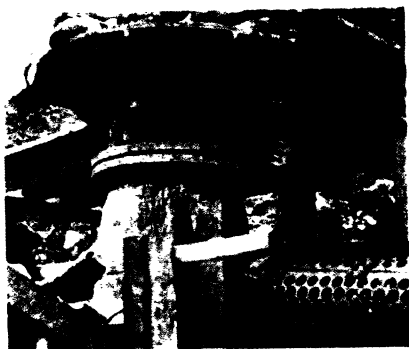
—**Lime**—The product resulting from the mechanical crushing or grinding of quicklime to a particle size which varies according to a definite specification or use.

—**Slag**—Blast furnace slag which has been passed through a crushing machine for the purpose of reducing the size of the particles.

—**Stone**—The product resulting from the artificial crushing of rocks, boulders or large cobblestones, substantially all faces of which have resulted from the crushing operation.

**Crusher, Blake**—(See Blake crusher.)

**Crusher, Double-roll**—A crushing machine consisting of two heavy cylinders supported at a fixed distance apart by powerful springs. These rolls are revolved toward one another and the material to be crushed is dropped between them



*Gyratory crusher and screen*

—**Gyratory**—A crushing machine in which a conical head has a gyratory (or eccentric) movement inside an outer concave bowl. (See gyratory breaker.)

—**Jaw**—A crushing machine in which motion is imparted to a movable jaw through means of a toggle joint which exerts the maximum force when the jaw is at the ex-

treme of travel on its working stroke.

—**Pot**—A crushing machine consisting of a corrugated cone revolving on a vertical shaft inside a corrugated hopper.

—**Run**—The product of the crushing plant without being rescreened or separated into various sizes.

—**Run Slag**—The product of a slag crushing plant, having been neither screened nor graded, with a maximum size of about 4 inches.

—**Run Stone**—The product of a stone crusher, unscreened except for the removal of the particles smaller than remaining on about one-fourth inch screen.

—**Single-Roll**—A crushing machine consisting of a fluted or toothed roll revolving close to a heavy iron or steel block designated as the crushing plate. The roll usually carries a number of teeth projecting above the general surface and known as sluggers.

**Crushing Strength**—In geology, the resistance which a rock offers to vertical pressure placed upon it. It is measured by applying graduated pressure to a cube, one square inch, of the rock tested. A crushing strength of 4,000 pounds means that a cubic inch of the rock withstands pressure to 4,000 pounds before crushing.

—The resistance offered per unit of area of a material to being broken at the time of fracture.

**Crust**—That portion of a macadam or similar roadway above the foundation consisting of the road metal proper with its bonding agent or binder.

**Cryohydrate**—In chemistry, the solid which separates when a saturated solution freezes. It contains the solvent and the solute in the same proportions as they were in the saturated solution.

**Cryolite**—A fluoride of sodium and aluminum,  $\text{Na}_3\text{AlF}_6$ , containing 54 per cent fluorine, 13 per cent

aluminum, and 33 per cent sodium. Found in West Greenland.

**Cryptocrystalline**—A term commonly applied to a rock having minutely crystalline structure.

**Crystalline (rock)**—Is commonly applied to those rocks consisting of crystallized minerals and no glass.

—**Fracture**—A fracture leaving small crystals showing.

—**Limestone**—Limestone composed largely or wholly of crystallized material, commonly as the result of metamorphism.

—**Schists**—Rocks that have been entirely or partly recrystallized by metamorphism. They are named after their predominating mineral, as chlorite-schist, mica-schist, etc.

**Crystallization (metal)**—A term commonly used to describe the condition of metal that has become brittle from fatigue.

—**Curve**—A curve used in a phase diagram to indicate the course of crystallization of the compounds.

**Crystallogeny**—The science and theory of the production of crystals.

**Culled**—Assorted; picked out; selected.

**Culm Bar**—A peculiar bar used in grates designed for burning culm or slack coal.

**Cultivating**—The process of loosening the surface of the soil to permit entrance of air (oxygen) and conserve moisture in the ground.

**Culturally Induced Erosion**—In soil conservation, erosion caused by increased run-off or wind action due to the work of man in deforestation by cutting or burning, cultivation of the land, overgrazing, and disturbance of natural drainage; the excess of erosion over that normal for the area.

**Culture**—Those features of the terrain that have been constructed by man, such as roads, trails, buildings, and canals; also, boundary lines; and all names and legends.

**Culvert**—Structure for purpose similar to bridge, but of span less than

the minimum span defined for a bridge. (One foot or more but less than 10 feet.) It is designed to support a super-imposed load of earth or other filling material plus the live load.

**Cumberlandite**—Ultra-basic, igneous rocks consisting essentially of magnetite, plagioclase, olivine and secondary minerals.

**Cumulative Dividends**—Most preferred stocks bear cumulative dividends; that is, unpaid dividends accumulate from year to year and must be paid before the common or other junior stocks receive any dividends.

—**Vibration**—A piling up or a superposing of vibration. An increasing vibration.

**Cumulose Deposits**—Peat, muck, and swamp soils in part.

—**Soil**—Sedentary soils formed by the accumulation of more or less decayed remains or organisms.

**Cupel Dust**—A powder used in purifying metals; also called Coppel dust.

**Cuprite**—A cuprous oxide,  $\text{Cu}_2\text{O}$ , containing 11 per cent oxygen and 89 per cent copper.

**Curb**—In tunneling, a broad, flat ring of wood, iron or masonry, in tunnel construction, placed under the bottom of a shaft to prevent unequal settlement, or built into the walls at intervals for the same purpose.

—To hold back.

—Construction along the edges of a street or road surface to define the limits of vehicle usable space and to prevent vehicles from going farther off the surface. It is the back of a street gutter.

—**Market**—A preliminary market for stocks which may some day be listed on the New York Stock Exchange.

**Curing** (of concrete)—The term "curing" is used in reference to the continuing of active chemical reactions. In the presence of water

and favorable temperatures, curing can proceed. It is through this curing that the internal structure of the concrete is built up to provide strength and water-tightness.

**Current**—The down-stream moving portion of flowing water.

—Flow of electricity.

—**Capacity**—(See capacity current.)

—**Continuous** (electricity)—(See continuous current.)

—**Low Potential**—(See low potential current.)

—**Meter**—A device for determining the velocity of flowing water by ascertaining the speed at which a vane or wheel is rotated by the current.

—**Secondary**—(See secondary current.)

—**Unperiodic**—(See unperiodic current.)

**Current-Breaker**—In electricity, any device or apparatus used for opening the circuit of an electric current.

**Currents, Transient**—(See transient currents.)

**Curve**—Departure from a straight line either uniformly or with a uniformly increased rate. (See spiral.)

—**Compound**—A continuous change in direction of alinement by means of two or more contiguous simple curves of different degrees having a common tangent at their junction points.

—**Degree of**—The angle subtended at the center of a simple curve by a 100-foot chord.

—**Easement**—A curve whose degree varies either uniformly or in some definitely determined manner so as to give a gradual transition between a tangent and a simple curve, which it connects, or between two simple curves.

—**Reverse**—Two contiguous simple curves in opposite directions, with a common tangent at their junction point.

- Simple**—A continuous change in direction of alinement by means of an arc of a single radius.
- Vertical**—An easement curve in the track or road surface to connect intersecting grade lines.



*Photo courtesy Armco Culvert Manufacturers Association*

*Corrugated iron cut-off walls at right angles to pipe*

- Curved Lead**—In railroad work, the length measured on the outside gage line of turnout from the point of switch to the point of frog.
- Top Chord**—A top chord that approximates to the form of a curve. Strictly speaking, such a chord is "polygonal," as curving chords between panel points is not permissible.
- Cusec**—A cubic foot per second.
- Cushion Course** (for brick pavement)
  - A thin layer on top of the base or foundation in which the brick are laid or embedded.
- Template, Trussed**—(See trussed cushion template.)
- Cut**—Depth to which material is to be excavated (cut) to bring the surface to a predetermined grade; whence, the difference in elevation of a surface point and a point on the proposed sub-grade vertically below it.
- Cut Holes**—The first round of holes fired in a tunnel or shaft. They are so placed as to force out a cone-shaped core in the center of a heading, and relieve the burden on the second round of shots.
- Cut-and-Fill**—A process of building canals, roads, or embankments by excavating part of the depth and using the excavated material for the adjacent embankments. In a balanced cut-and-fill the excavated material is precisely enough for the embankments, with an allowance for settlement.
- Cut-Backs**—Petroleum or tar residuums which have been fluxed with distillates.
- Cut-Back Asphalt**—Asphalt cement which has been rendered liquid by fluxing it with a light volatile petroleum distillate. Upon exposure to atmospheric conditions the volatile distillate evaporates, leaving the asphalt cement behind.
- Medium Curing**—(See medium curing cut-back.)
- Rapid Curing**—(See rapid curing cut-back.)
- Cut-Off**—Quarrymen's term for the direction along which the granite must be channeled, because it will not split. Same as "hard-way."
- An engineering term for a wall, collar, or other structure, intended to reduce percolation of water along otherwise smooth surfaces, or through porous strata.
- Trench**—An engineering term for an excavation in the base of a dam or other structure filled with relatively impervious material to reduce percolation.
- Wall (diaphragm)**—A collar at right angles to a conduit to prevent longitudinal seepage along the conduit.
- Cut-Stone**—A stone that is carefully "dressed" or shaped with tools.
- Cuttings**—In geology, the rock fragments bailed from a drilled well.
- Cut-water**—The upper wedge-shaped end of a bridge pier.

**Cyanide Mill**—A mill in which the cyanide process is carried on.

—**Process**—A process for the extraction of gold from finely crushed ores, concentrates and tailings by means of cyanide of potassium used in dilute solutions. The gold is dissolved by the solution and subsequently deposited upon metallic zinc or by other means.

**Cycle** (electrical)—One complete set of positive and negative values of an alternating current.

—In acoustics, one complete set of the recurrent values of a periodic quantity comprises a cycle.

—(engine)—A period in the operation of an internal combustion engine, as two cycle or four cycle; the number of strokes, up and down, of the piston from igniting point to next successive igniting point.

**Cyclogiro**—A type of rotor plane

whose support in the air is normally derived from airfoils mechanically rotated about an axis perpendicular to the plane of symmetry of the aircraft, the angle of attack of the airfoils being always less than the angle at which the airfoils stall.

**Cyclopean Concrete**—Concrete in which stones weighing more than 100 pounds are individually embedded.

**Cylinder Metal**—Cast iron alloyed with two or more per cent of manganese and possessing a low coefficient of friction when highly polished. Used for engine cylinders.

**Cyma**—In architecture, a moulding composed of reversed curves, cyma-recta and cyma-reversa.\*

**Cymatium**—In architecture, the crowning member of a cornice, usually a cyma.\*

## D

**Dacite**—A vitrophyric or felsphyric, generally volcanic, igneous rock, containing essential plagioclase and quartz, with or without hornblende and biotite or both.

**Dado**—In architecture, the die of a pedestal or wall. The vertical section between the base and the cornice. Wall treatments are termed podiums.\*

**Dam**—In engineering, a barrier to confine or raise water for storage or diversion or to create an hydraulic head.

—**Plate**—In a blast furnace, the cast-iron plate which supports the dam or dam stone in front.

**Damaged Rail**—Any rail broken or injured by wrecks, broken, flat or unbalanced wheels, slipping or similar causes.

**Damask**—The etched or "watered" surface produced on polished steel, by corrosion.

**Damp-Course**—In stone masonry, a waterproofed course or bed joint in a wall, usually just above the surface of the ground; its purpose being to prevent the rise of water in the pores of the stone and mortar due to capillary action.

**Damper**—In air conditioning, a butterfly or shutter device for shutting off or regulating the air flow in ducts, etc.

**Dampproofing**—The treatment of any material or structure to prevent the entrance or passage of water or other liquid not under head.

**Danger Cone**—A pennant or a hollow cone of light cloth on the wire cable of a captive balloon to warn aircraft of its presence.

**Dap**—To notch a timber.

**Dash Pot**—A device for cushioning or damping a movement to avoid shock, consisting essentially of a

cylinder containing air or a liquid and a piston moving in it.

**Data**—Facts, and particularly those that can be numerically expressed.

**Datum**—(leveling) Any level surface taken as a surface of reference, from which to measure elevations; for example, mean sea level. Often spoken of as a "datum plane." The actual elevation of a datum above or below mean sea-level may be unknown, but the datum can still be used as a surface of reference. In ordinary leveling it is assumed that all such surfaces are parallel to each other. A datum defined by "mean high water" or "mean low water" is actually a level surface, the elevation of which depends upon tidal observations at a given place; it does not necessarily agree with high or low water at any other place.

—(geodesy) The basis for the computation of geodetic latitude and longitude, consisting of (a) an adopted latitude and longitude for (b) a selected station on a given spheroid, together with (c) a specified azimuth to an adjoining triangulation station. It may also include (d) specified methods of calculating the positions and azimuths. (Example: The North American Datum specifies the latitude and longitude for the station, Meade's Ranch (Kansas), on the Clarke spheroid of 1866 and also the azimuth to the station, Waldo. All geodetic positions on the American continent depend upon this position. The "North American Datum of 1927" specified that Laplace azimuths shall be used.)

—(photographic mapping) The assumed horizontal plane on which the map is constructed.

—**Level**—The level (usually sea

- level or nearest body of water) from which altitudes are measured in surveys.
- Plane**—A plane of reference used as a basis for computing elevations.
- Dawson Producer**—A furnace used for the manufacture of producer gas.
- Dead Load**—A steady inactive weight.
- The weight of a structure, together with fill, pavement and other permanent weights.
- Oils**—Oils with a density greater than water which are distilled from tars.
- Load Stress**—The stress resulting from the application of a static load. Generally means the stress produce in a structure by its own weight.
- Deadman**—An anchorage for a guy, cable, etc., consisting of a timber or piece of structural steel buried in the ground with the end of the guy line fastened around its middle.
- Melt**—In the fusion of metals, a condition of being fully or completely melted, and in which no gas is being evolved.
- Rise**—In a cross section of a float or flying-boat hull, the amount by which the height of the chine differs from that of the keel.
- Rise, Angle of**—(See angle of dead rise.)
- De-aired Brick**—Brick formed from ground shale or clay from which air has been extracted during the process of manufacture.
- Debenture**—A debenture is an unsecured promise to pay.
- Debris**—Rock fragments, sand, earth, and sometimes organic matter, in a heterogeneous mass, as at the foot of a cliff; the silt, sand, and gravel that flow from hydraulic mines.
- Miscellaneous collection of materials deposited by flood waters.
- The sand, soil, and gravel moved by a flowing stream; detritus.
- Cone**—A fan-shaped deposit of soil, sand, gravel, and boulders built up at the point where a mountain stream meets a valley, or otherwise where its velocity is reduced sufficiently to cause such deposits.
- Dam**—In soil conservation, a barrier built across a stream channel to store debris, such as sand, gravel, silt, driftwood, etc.
- Decalage**—The difference between the angular settings of the wings of a biplane or multiplane. The decalage is measured by the acute angle between the chords in a plane parallel to the plane of symmetry. The decalage is considered positive if the upper wing is set at the larger angle.
- Decant**—To pour off from the edge or lip of a vessel; to pour off gently so as not to disturb the sediment or precipitate; to pour from one vessel to another.
- Decarburizing**—To remove the carbon from a compound or substance. Same as decarbonizing.
- Decastyle**—In architecture, a 10-column treatment.\*
- Decay**—Disintegration of the wood substance due to the action of wood-destroying fungi. Dote; rot.
- Incipient**—The early stage of decay which has not proceeded far enough to soften or otherwise perceptibly impair the hardness or strength of the wood.
- Decibel**—In acoustics, one-tenth of a bel, the number of decibels denoting the ratio of two amounts of power being 10 times the logarithm to the base 10 of this ratio. The abbreviation "db" is commonly used for the term decibel.
- Deciduous**—A plant that sheds or loses its foliage at regular intervals, noticeable by leaving bare branches.
- Declination**—Horizontal angle between the (magnetic) axis of the magnetic needle and the true, or

geographic meridian. (This angle is called "Variation of the Compass" by navigators.)

—**Angular distance** of a celestial object, north or south of the celestial equator, measured by the arc of a great circle (that is, at the center of the earth) in a plane perpendicular to the equator.

**Declination** (of the moon)—Its changing angular distance north or south of the plane of the earth's equator, as it passes through an angle of approximately  $23\frac{1}{2}$  deg., either side of the equator.

**Deck**—The flooring of a bridge.

—**Double**—A condition of a span having two decks, one over the other.

—**Structure**—A structure whose main supporting members are below the deck.

—**Truss**—A loose expression for the truss of a deck span.

**Declinometer**—A magnetic needle suitably arranged for the measurement of the value of the magnetic declination or variation at any place.

**Decorative Marble**—Marble, including also those natural stones not strictly marble, such as serpentine and the semi-crystalline fossiliferous or so-called "fancy" limestones that will take a high polish, which by reason of their coloring and marking, or other physical properties, or both, are suited more particularly for interior decorative purposes.

**Dedolomitization**—The alteration of a dolomite into some other rock, as for example into a serpentine.

**Deep Well Power Pump**—A reciprocating pump, driven by power from an outside source applied to the pinion shaft of the pump, and consisting of three major parts; the power head—located at the surface of the ground; the cylinder (the pumping element)—located under water in the well; and the drop pipe and rods—connect-

ing the power head with the cylinder, forming a conducting pipe for the water from the cylinder to the surface of the ground.

—**Double Stroke Rod Pump**—A reciprocating power driven pump having two sets of pump rods connecting the reciprocating mechanism of the power head with the cylinder plungers. One line of rod is hollow and the other is solid and works inside of the hollow rods. The weight of one set of rods balances the weight of the other set. The cylinder plungers are single acting in type and work one above the other in the same cylinder.

—**Single Stroke Rod Pump**—A reciprocating power driven pump having a single pump rod connecting the reciprocating mechanism of the power head with the cylinder plunger. This plunger may be either a single acting type or a double acting type.

**Definite Proportions, Law of**—(See law of definite proportions.)

**Definition**—(photography) Sharpness of image.

**Deflation**—In geology, the removal of loose material by the wind, leaving the rocks bare to the continuous attack of the weather.

—**Sleeve**—(1) A sleeve or appendix made of fabric provided for the special purpose of facilitating the deflation of an aerostat. (2) The sleeve or appendix fitted in the lower lobe of a kite balloon and used to permit the rapid escape of the air in the lobes when the balloon is hauled down.

**Deflection**—In drainage, change in shape or decrease in diameter of a conduit, produced without fracture of the material.

—In surveying, an angular variation from a true course.

—In general, an angular variation from an established direction or plane.

- The amount of dip or sag in a horizontally suspended wire rope.
- A lateral motion, a motion at right angles to the length of the piece. Also the amount of such motion expressed in some lineal unit as inches.
- Of Plumb Line, Local**—The angle between the actual direction of the plumb line and that of the normal to the spheroid that represents the figure of the earth. (Sometimes called Station Error.)
- The displacement of any point of a member that alters its nominal shape.
- Deflector**—In air conditioning, a plate or partition in ducts for deflecting or directing the flow of air.
- Deformation**—Change of form. A change of shape in a member or combination of members without any breach of the continuity of its parts.
- The change in dimensions of a body not breached caused by stress.
- Deformed Bar**—Reinforcing bars with closely spaced shoulders, lugs or projections formed integrally with the bar during rolling so as to firmly engage the surrounding concrete. Wire mesh with welded intersections not farther apart than twelve inches in the direction of the principal reinforcement and with cross wires not smaller than No. 10 may be rated as a deformed bar.
- Degradation**—The lowering of any portion of the earth's surface by erosive processes; especially the removal of material through erosion and transportation by running water.
- Degreasing**—The process of removing fats and greases from sewage, waste, or sludge.
- Degree (in temperature)**—The change in temperature as will produce 1/100 the change in pressure which is observed when the hydrogen is heated from the ice-point to the steam-point.
- (In surveying)—One degree is 1/360 part of the circumference of a circle.
- (In circular measure)—0.017453 radian, or 1/360 of the plane complete angle about a point.
- Of Curve**—The number of degrees at the center of a circle subtended by a chord of 100 ft. Occasionally, in highway surveying, it is defined as the central angle subtended by an arc of 100 ft.
- Of Purification**—A measure of the removal and oxidation of the objectionable or putrescible contents of sewage.
- Degree-Day**—In heating and air conditioning, a unit representing a difference of one degree Fahrenheit existing for one day between the average indoor and outdoor temperatures. The standard degree-day is based on an average indoor temperature of 65 F. Degree-day tables are based on weather bureau records and reflect both the number of days in a heating season and the number of degrees Fahrenheit through which a building must be warmed during that season.
- Dehydrated Tars**—Tars from which all water has been removed.
- Deliquescence**—In soil stabilization, this is the process of dissolving and becoming liquid by attracting and absorbing moisture from the air; for example, the liquefaction of calcium chloride.
- Delivery Box**—In irrigation, a structure for the control and measurement of water delivered to a farm unit.
- Delta-Metal**—A non-rusting, copper, zinc, and iron alloy resembling Aich's-metal and sterro-metal.
- Deltas**—In geology, the terminal deposits of rivers; for example, the delta of the Nile and Mississippi rivers.

**Demurrage**—The amount paid a railroad company for holding a car beyond a certain time.

**Dendrites**—Plant-like crystallization of iron or manganese oxides on the surface of fissures in any rock or mineral.

**Dense and Open Graded Aggregates**

—The term dense is applied to a graded mineral aggregate which contains sufficient dust or mineral filler to reduce all void spaces in the compacted aggregate to exceedingly small diameters approximating the size of voids in the filler itself. It may be either coarse or fine graded. The term open is applied to a graded mineral aggregate containing no mineral filler or so little that void spaces in the compacted aggregate are relatively large.

**Density**—Density is a scientific term meaning the mass of a unit volume. Its numerical expression will vary with the units selected, and there is no occasion for using it when the term "specific gravity" is defined. Confusion may be avoided by not using the word "density" in specifications. The use of this term should be avoided if possible.

—(Of wood)—A term used to denote the relative proportion of spring wood and summer wood and also the number of annual rings per inch.

—(In case of aggregate and composite pavements) Used to express the relative amount of voids.

—**Altitude**—The altitude corresponding to a given density in a standard atmosphere.

—**Sound Energy**—(See sound energy density.)

**Dental** (hydraulics)—A tooth-like projection on an apron or other surface to deflect or break the force of flowing water; a form of baffle.

**Dentated Sill**—A hydraulic term referring to a notched sill at the end

of an apron to check the force of flowing water and thus reduce erosion below the apron.

**Dentils** — In architecture, oblong, tooth-like blocks used in the Doric, Ionic and Corinthian cornices.\*

**Denudation**—In geology, the wearing down and disintegration of rock masses by rain, frost, wind, running water and other superficial agencies.

**Denuding**—Used in roadside development to denote the removal of underbrush and other plant life by erosion by natural forces as well as by cutting, fire or other man-caused agencies.

**Deoxidized Steel**—Steel from which oxygen and other gases have been removed, so far as practical, during manufacture to prevent the formation of blow holes in the ingot. The principal deoxidizers are manganese, silicon, titanium and aluminum.

**Departure**—The length of the projection of a traverse course on a line perpendicular to the meridian (length of course times sine of bearing). (Called also "Easting" or "Westing.")

**Depletion**—An appraisal term defined as the quantitative exhaustion of natural resources, usually in connection with commercial exploitation and usually recorded in monetary terms.

—**Rate**—An appraisal term defined as the rate or per cent at which depletion takes place, usually expressed by the yearly or monthly percentage of the stated cost or value applicable to the deposits.

**Deposit**—Anything laid down. Formerly applied to (suspended) matter left by the agency of water, but now made to include also mineral matter in any form, and precipitated by chemical or other agencies, as the ores, etc., in veins.

—To place.

**Deposited Metal**—In welding, filler

metal which has been melted by a fusion welding process.

**Deposits, Cumulose**—(See cumulose deposits.)

—**Ore**—(See ore deposits.)

**Depreciation**—(a) Loss in useful value from any cause, but in appraisal technique it is exclusive of the loss from price fluctuation; (b) loss in value of an old or used item in comparison with a new item of like kind, resulting from deterioration, obsolescence, inadequacy, lack of utility and other causes deemed to lessen usefulness.

—**Accrued**—An appraisal term defined as the actual depreciation existing in a property at a given date, representing the difference between the base or standard used for the comparison (e. g., cost of a new property) and the value. Usually a factual determination by inspection and not by the application of a theoretical formula. It may be compared with, but is not synonymous with, a "depreciation reserve" account.

—**Economic**—An appraisal term defined as the loss in value resulting from external economic conditions affecting the character or degree of utilization, such as changes in environment, earning power, etc.

—**Observed**—An appraisal term defined as loss, as estimated from personal inspection and judgment of the property's condition and utility, compared with a new property, usually included in the amount of depreciation accrued or anticipated as of a given date.

—**Physical**—An appraisal term defined as loss in value resulting from physical or tangible conditions affecting the article itself. A term of doubtful significance and sometimes erroneously used as synonymous with depreciation.

—**Rate**—An appraisal term defined as the rate or percentage at which value or usefulness of a property is being exhausted, or at which

amounts are computed to be set aside to provide for anticipated lessening in value during the remaining useful life.

—**Reserve**—An appraisal term defined as the book account wherein the "accruals for depreciation" are recorded; usually determined upon the basis of a theoretical rate of depreciation. It reflects the book provisions for the accruing depreciation, but the amount in the account does not necessarily coincide with the actual depreciation of the property.

—**Sinking Fund Method**—An appraisal term defined as provisions by which the sums, actually or theoretically set aside for depreciation, are computed as equal periodic amounts which, with regular interest accumulations, will equal the stated depreciable base at the expiration of the estimated life. Thus: an annual provision of \$83.20 with interest at 6 per cent compounded annually would amount to \$1,000 in 10 years.

—**Straight Line Method**—An appraisal term defined as provisions by which the sums, actually or theoretically set aside for depreciation, are computed at an equal periodic rate by dividing the depreciable base by the number of years or periods of expected life. Thus, with a base of \$1,000 and an estimated life of 10 years, the annual rate would be 10 per cent to produce an annual charge of \$100 and a total of \$1,000 in 10 years.

—**Theoretical**—An appraisal term defined as loss or provision for loss in value estimated by formulae or theoretical standards (such as the "straight line" method) not tested against the property facts.

**Depressed Sewer**—A sewer crossing beneath some natural or artificial obstruction, which runs full or under greater than atmospheric pressure because its profile is depressed

below the hydraulic grade line.

**Depth** (ballast)—In railway use, the distance from the bottom of the tie to the top of the sub-grade.

—**Arch**—Thickness of the arch ring at any point at right angles to the axis.

—**Effective**—The perpendicular distance between the gravity lines of a truss or girder.

—**Truss**—The vertical distance between the center lines of the upper and lower chords.

**Derivatives, Resistance**—Quantities expressing the variation of the forces and moments on aircraft due to disturbance of steady motion. They form the experimental basis of the theory of stability, and from them the periods and damping factors of aircraft can be calculated. In the general case there are 18 translatory and 18 rotary derivatives.

**Derrick**—An apparatus for lifting and moving heavy weights. It is similar to the crane; but differs from it in having the boom, which corresponds to the jib of the crane, pivoted at the lower end so that it may take different inclinations.

—**Car**—A railroad car upon which a derrick is mounted.

—**Crane**—A crane in which the post is supported by fixed stays in the rear, the jib being pivoted like the boom of a derrick.

—**Gin Type**—A framework with four stiff legs, used in borings, or for lifting pipes in trenches.

—**Stiff Leg**—A derrick where stiff legs, usually of timber, take the place of guy lines for staying the mast.

**Design**—To proportion all the parts of a structure. A plan, or plans, showing the various parts of a structure, their sizes, and relations.

—**Load** (stress analysis)—A specified load below which a structural member or part should not fail. It is the probable maximum applied load multiplied by the factor

of safety. Also, in many cases, an appropriate basic load multiplied by a design load factor.

**Desmosite**—A banded contact rock developed from shales and slates by intrusions of diabase magma.

**Desulphurization**—The removal of sulphur from sulphide ores.

**Detail**—One of the smaller parts into which any construction or design may be divided. To go into particulars. To draw the particular parts.

—**Fracture**—A progressive transverse fracture originating at the surface of the head of a rail. It should not be confused with a transverse fissure.

**Detention Period**—Period of detaining or holding moving liquid in tank, channel, or body, for a specified time.

**Detergent**—A cleansing agent.

**Deterioration**—In appraisal work, the destructive effect brought about by wear and tear, disintegration, use in service, and the action of the elements.

—This term should be used to describe a structure or concrete which is beginning to show the effects of weathering or other destructive agencies but in which the effect has not progressed to the point where the term disintegration can properly be applied.

—**Structural**—(See structural deterioration.)

**Detonator**—A device used for exploding a charge of dynamite or other high explosive. The charge is called a "shot."

—**Tube**—A eudiometer fitted for making explosions.

**Detour**—A route traffic follows in going around a closed portion of a road; a temporary route.

**Detritus**—A general name for incoherent sediments, produced by the wear and tear of rocks through the various geological agencies. The name is from the Latin for "worn." Rock waste.

- Tank or Chamber**—A detention chamber larger than a grit chamber, usually with provision for removing the sediment without interrupting the flow of sewage. A settling tank of short detention period designed, primarily, to remove settleable solids.
- Detrusion**—A lateral deformation in which particles of a body apparently slip past each other. It is caused by a shearing force.
- Devitrification**—The process by which glassy rocks break up into definite minerals. The latter are excessively minute and are chiefly quartz and feldspars.
- Devonian**—In the ordinarily accepted classification, the fourth in order of age of the periods comprised in the Paleozoic era, following the Silurian and succeeded by the Carboniferous. Also the system of strata deposited at that time.
- Dew Point**—The temperature at which condensation of water vapor in the air takes place.
- Dew-Point Temperature**—In heating and air-conditioning, the temperature at which air would become fully saturated (100 per cent relative humidity) with its present moisture content. Its importance in air conditioning lies in the fact that when air containing a certain amount of moisture is cooled below its dew-point temperature, part of its moisture content is condensed. This makes it possible to dehumidify air by refrigeration.
- Diaclase**—In geology, a line of rectangular fracture; a term applied by Daubree to explain the fact that the lines of weakness in the earth's surface are perpendicular to one another.
- Diagenesis**—The consolidation of clastic rocks by static metamorphism involving not much if any recrystallization. Examples may be muds to shales and clays to slates.
- Diagonal Bond**—A group of bars covering a width approximately 0.4 the average span, symmetrical with respect to the diagonal running from corner to corner of the panel of a slab.
- Bracing**—Bracing along diagonal lines.
- Direction**—A direction parallel or approximately parallel to the diagonal of the panel of a flat slab.
- Diagonals**—The inclined members of a truss or frame.
- Diagram**—A sketch, outline, or skeleton drawing.
- Erection**—A skeleton drawing of a truss or span showing all pieces in their relative positions, properly lettered and numbered in order to facilitate the process of erection.
- Force**—A diagram in which the amounts and directions of forces are represented by lines for the purpose of finding their resultant.
- Moment**—A curve showing the values of the bending moments in a beam or truss at various sections thereof.
- Shear**—A diagram showing the variations of the shear along a beam or truss.
- Dialectric, Condenser**—(See condenser dialectric.)
- Diallage**—A variety of pyroxene which in addition to the prismatic cleavages has others parallel to the vertical pinacoids.
- Dialysis**—The separation of crystalloids and colloids in solution, by means of their unequal diffusion through certain natural or artificial membranes.
- Diamagnetic**—Bodies tend to set the longest dimension across the magnetic field. The permeability of a diamagnetic substance is less than unity.
- Diametral Wire**—A chord wire that passes through or near the center of a main transverse frame. It is usually attached to the axial fitting.
- Diamond, Black**—(See black diamond.)

—**Drill**—A form of rotary rock drill in which the work is done by abrasion instead of percussion, black diamonds (borts) being set in the head of the boring tool. Used in prospecting and development work where a core is desired.

—**Saw**—A circular disc having diamonds (or diamond dust) set in its cutting edge. It is employed for sawing stone.

**Diaphragm**—A thin plate or partition across a bridge member to stiffen the same.

**Diaphragm**—The cross-hair ring or metal piece holding the cross-hairs or spider lines in a telescope. (Also called Reticule.)

—(photography) A device for controlling the amount of light passed by a lens and for cutting out such rays as would tend to mar the perfection of the image. (Also called the Stop.)

—**Ballonet**—The fabric partition between the gas and air compartments of the envelope of a non-rigid or semirigid airship or kite balloon.

—**Plate**—A stiffening plate used in the interior of a column to give it additional strength and rigidity.

**Diastrophism**—The process or processes by which the crust of the earth is deformed, producing continents and ocean basins, plateaus and mountains, flexures and folds of strata, and faults.

**Diastyle**—In architecture, treatments employing three diameters clearance between adjacent columns.\*

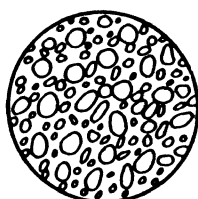
**Diathermic**—Allowing a free passage of heat.

**Diatom**—A minute plant which is provided with a siliceous envelope.

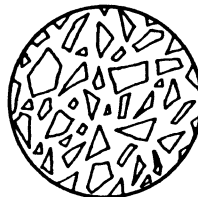
**Diatomaceous Earth**—Is composed essentially of the siliceous skeletons of diatoms, extremely minute uni-celled organisms. It is composed mainly of silica, white or light gray in color, and is extremely porous.



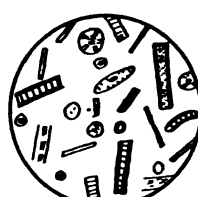
OOOLITIC  
LIMESTONE



CONGLOMERATE



BRECCIA



DIATOMS

*Sketch showing the structure of oolitic limestone, conglomerate, breccia, and diatoms from which "diatomaceous earth" is formed*

**Diatreme**—In petrology, a general term for volcanic pipes and vents drilled through the enclosing rocks by the explosive energy of gas-charged magmas.

**Dicalcium Ferrite**—In cement technology, an iron compound which may be formed in the presence of an excess of  $\text{Fe}_2\text{O}_3$ . Commonly abbreviated to  $2\text{CaO} \cdot \text{Fe}_2\text{O}_3$  or  $\text{C}_2\text{F}$ .

**Die**—A steel former or device for shaping, impressing, or cutting out something.

**Dies, Screw**—Two flat plates of hardened steel having a semi-circular groove cut in the edges making contact with each other. This groove has an internal thread, so that when the two pieces are brought together in a stock a female screw is formed. It is used for cutting threads on rods, bolts, etc.

**Diesel Engine**—An internal combustion engine in which fuel oil, blown as a vapor into the cylinder, ignites spontaneously from heated air previously compressed by the engine

to a pre-determined point above the firing point of the fuel.

**Differential Aileron Linkage Arrangement**—(See aileron linkage arrangements.)

**Differential Leveling**—Leveling in which the object is simply to find the difference in elevation between two or more points without regard to distances between the points.

**Diffraction**—If the light source were a point the shadow of any object would have its maximum sharpness; a certain amount of illumination, however, would be found within the geometrical shadow due to the diffraction of the light at the edge of the object.

**Diffuse Sound**—In acoustic, sound is said to be in a perfectly diffuse state when in the region considered, the energy density, averaged over portions of the region large compared to the wavelength, is uniform and when all directions of energy flux at all parts of the region are equally probable.

**Diffuser**—(in sewage work) A porous plate or other device through which air is forced and enters the sewage in the form of minute bubbles.

—**Or Splitters**—In air conditioning, plates or partitions in ducts for directing or properly diffusing the air over the area of the duct.

**Diffusion Vane or Turbine Pump**—A pump equipped with removable diffusion vanes.

—**Vanes**—In centrifugal pumps, a fixed or removable casting between the impeller and the casing with liquid passages designed to convert velocity head to pressure head.

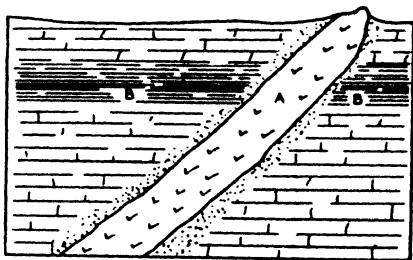
**Digestion**—The bio-chemical decomposition of organic matter resulting in the formation of mineral and simpler organic compounds.

**Dihedral Angle**—The acute angle between a line perpendicular to the plane of symmetry and the projec-

tion of the wing axis on a plane perpendicular to the longitudinal axis of the airplane. If the wing axis is not approximately a straight line, the angle is measured from the projection of a line joining the intersection of the wing axis with the plane of symmetry and the aerodynamic center of the half-wing on either side of the plane of symmetry.

**Dike**—In geology, a mass of granite, diabase, basalt, or other rock which has been erupted through a narrow fissure.

—In marine work, a structure of earth, stone or timber erected as a barrier to check, deflect or stop water currents.



*Dike of igneous material intersecting bedded rock. Note contact zone between dike and adjacent rock. A = dike. BB = bedded rock.*

**Dillonite**—This patented type is made from any aggregate which need not be free from clay. Sodium hydroxide in a 2 per cent solution is sprayed onto the dried aggregate in the mixer. The patent claims that when this is done the NaOH forms the clay into balls and they harden.

**Dilution**—A method of disposing of sewage or effluent by discharging into a stream or other body of water.

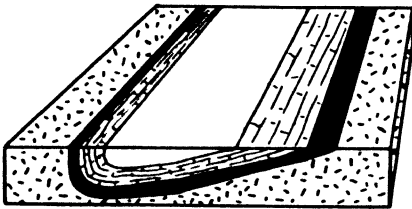
—The ratio of the volume of flow of a stream to the volume of sewage or effluent discharged into it.

**Diluvium**—A name for the unsorted and sorted deposits of the glacial period.

**Dimension Stone**—Stone quarried in accordance with required dimensions.

**Diorite** (rock) — An intermediate plutonic rock, consisting chiefly of oligoclase, andesine or labradorite feldspar, and hornblende, augite or biotite.

**Dip** (of rock)—Is the angle of inclination of the plane of stratification with the horizontal plane.



*Effect of dip on the thickness of strata*

**Dipping Compass**—A compass having the needle fixed to swing in a vertical plane, so it can be readily deflected by magnetic rocks.

**Dipteral**—In architecture, a treatment employing a double row of columns on either side.\*

**Dipyr**—A variety of scapolite, sometimes used as a prefix to the names of rocks which contain the mineral.

**Direct Acting Pump**—A steam-driven reciprocating pump in which the steam piston is directly connected to the liquid piston or plunger through the piston rod. The length of the stroke is determined by the action of the steam in the steam cylinder.

**Direct Aeration**—Activated sludge produced by blowing air into sewage.

—**Bond**—A group of bars, covering a width approximately 0.4 l<sub>1</sub>, symmetrical with respect to the center lines of the supporting columns of a flat slab.

—**Cost**—In economics, those costs directly assignable to a group of

similar units of product without prorating.

—**Drive Engine**—A term applied to a motor car engine that is direct connected to the drive axle of the car, thus making it necessary to push the car to start the engine.

—**Oxidation Process**—(so-called) A proprietary method of treatment in which sewage previously dosed with lime is passed through closed tanks between plate electrodes across which electric current is passing while the liquid is agitated by rotating paddles.

—**Stress**—A stress resulting from a direct application of the load.

**Direction**—Angle to the right (clockwise) from an arbitrary zero direction. (Used chiefly in triangulation.)

—Relative position of one point with respect to another, designated in engineering as rear and forward, right and left, in lieu of compass pointings. Rear is toward the beginning of a route, forward is away from the beginning, right and left are always taken facing forward on the route.

**Directional Gyro**—A gyroscopic instrument for indicating direction, containing a free gyroscope which holds its position in azimuth and thus indicates angular deviation from the course.

—**Stability**—Stability with reference to disturbances about the normal axis of an aircraft; i. e., disturbances which tend to cause yawing.

**Disc Pile**—One having a disc attached to its foot to provide a larger bearing area.

—**Screen**—A rotating circular perforated disc, with or without a central truncated cone of similar material mounted on the center. Usually of large diameter and heavy plate thickness.

**Discharge**—Flow; this latter term is recommended as preferable.

—**Curve**—A rating curve; a preferable term is "flow curve."

—**Header**—The duct through which the air is conducted from the supercharger to the engine.

—**Measurement**—A gaging; the term "flow measurement" is recommended as preferable.

—**Valve**—A device for permitting the discharge of compressed air or gas from the compressor cylinder and to prevent its return to the cylinder.

**Dischargeable (or Consumable)**

**Weight** (airship)—All weight that can be consumed or discharged and still leave the airship in safe operating condition with a specified reserve of fuel, oil, water ballast, and provisions, and with the normal crew.

**Discrepancy**—The difference between results of duplicate measurements.

**Disinfectants**—Substances in liquid or powdered form having power to destroy germs or insects on contact, some being insecticides, some only germicides, and others with both powers.

**Disinfected Sewage**—Crude sewage or a sewage plant effluent which has been treated with a disinfecting agent, commonly chlorine or "bleach," resulting in the destruction of bacteria sufficiently to reduce materially the danger of infection.

**Disinfection**—The destruction by the agency of some chemical of a large percentage of the bacteria in sewage or contaminated water, so as to reduce the danger of infection to a negligible quantity.

**Disintegration, Concrete**—This term should be used to describe actual separation or breaking up of the concrete itself; that is, the breaking down of the mass from any cause whatsoever. As examples of concrete disintegration, the following cases may be cited: breaking up of the mass due to freezing of entrapped moisture, disruption or loss of cementing value of the

paste by solution or chemical action; and breaking up through disintegration of the aggregates themselves.

—**Structural**—A concrete structure may present the appearance of being badly disintegrated as a structure, although the concrete itself may not be disintegrating. Disruption of structural relationships by breaking up of structural components.

**Disjointing**—The spreading or separation of the adjacent circumferential ends of the sections of pipe or conduit.

**Dispersion**—(sewage) A method of disposal of the suspended solids in sewage or effluent by scattering them widely in a stream or other body of water.

—(acoustics) The difference between the index of refraction of any substance for any two wave lengths is a measure of the dispersion for these wave lengths, called the coefficient of dispersion.

—**Ratio**—In soil physics, the ratio expressed in percentage, of the suspension percentage to the percentage of the total silt and clay in the soil, as determined by mechanical analysis.

**Displacement** — (aerial photography)

The horizontal displacement of the image of a ground point on a vertical aerial photograph due to the elevation of the point above or below the assumed ground plane. If no tilt exists it is radial from the principal point of the photograph; in a tilted photograph it is radial from the nadir point. Example: The vertical corner of a tall building is shown as a line, the top of the building being farther from the center of the picture than the base of the building. In an untilted photograph, this line, prolonged, passes through the principal point.

—In wood preserving, the volume of wood in a charge as deter-

mined by measuring the volume of liquid displaced by the wood in the cylinder.

—**Engine**—The total volume swept by the pistons of all the cylinders during one complete stroke of each piston.

—**Float or Hull**—The total volume, or total weight, of water displaced by a seaplane float or hull.

—**Resonance**—In acoustics, displacement resonance exists between a body, or system, and a sinusoidally applied force if any small change in frequency of the applied force causes a decrease in the amplitude of displacement.

—(Ship) The amount of water expressed in tons pushed out by a vessel when afloat and loaded to capacity.

**Dissociation**—The breaking up of a compound at some temperature into new compounds.

**Disthene**—A synonym for cyanite. Sometimes used as a prefix in rock names.

**Distillate, Engine**—A refined or unrefined petroleum fraction similar to naphtha, but often of higher distillation range.

**Distillation**—The process of separating creosote or tar or petroleum into "fractions" having different boiling temperatures. The material to be distilled is placed in a distilling flask, the temperature gradually raised and the vapors given off at various temperatures are condensed and collected separately.

**Distortion**—(aerial photography) Deformation of images caused by tilt. If there is tilt but no relief, displacements are radial from the isocenter, and their magnitudes depend on the angle and direction of tilt. If both tilt and relief exist, the combined displacements are not radial from any single point. **Film Distortion**—(photography) Errors in direction, scale, and shape, caused by failure of film to lie flat

in the camera, or by unequal contraction or expansion following exposure. **Lens Distortion**—(photography) Errors in position of photographic images caused by an improperly corrected lens.

**Distributaries** — In irrigation, the smaller conduits taking water out of laterals for delivery to the farms; any system of secondary conduits; the network of channels on a river delta.

**Distribution System**—In irrigation, the system of laterals, distributaries, and their appurtenances, conveying irrigation water from the main to the farm units.

**Distributor** — In sewage technology, a movable or fixed pipe or channel which distributes sewage upon the surface of sewage filters. There are three types of distributors—the rotary, the traveling and the fixed; the rotary moves about a central axis with delivery to a circular filter; the traveling moves back and forth the length of a rectangular filter; the fixed is placed upon the surface of the bed and spreads sewage uniformly over the surface.

—In road work, a tank truck piped for applying bitumens to a road surface in regulated uniform amounts.

—(construction equipment) — One who acts as a manufacturer's selling agent.

**Ditch**—An open waterway or channel, usually unpaved, for providing drainage.

—**Check**—A barrier placed in a ditch to decrease the slope of the flow



Photo courtesy Armo Culvert Manufacturers Association

*Corrugated iron ditch checks*

- line and thereby the velocity of the water. It is provided with a throat or spillway for dropping the water abruptly to a lower level.
- Lining**—Material such as stone, wood, concrete, metal or bituminous binder, for preventing leakage from or erosion of a ditch.
- Diurnal, or Daily Tide**—A tide in which only one high and one low water occur in a day.
- Age**—The lag of the tides in response to the changing declination of the moon.
- Force**—The tide-producing force having a period of approximately one day.
- Inequality**—The difference between morning and afternoon tides, due principally to the declination of the moon.
- Dive**—A steep descent, with or without power, in which the air speed is greater than the maximum speed in horizontal flight.
- (aeronautic)—(Stress analysis)—A design condition for the wings representing a steady state of flight characterized by high speed and an angle of attack approximately that of zero lift (cf. inverted flight and pull-up, sudden.)
- Diversion Canal**—The canal of an irrigation system, from the point of diversion to the beginning of the distribution system.
- Chamber**—A chamber which contains a device for diverting all or part of the flow. May be a manhole.
- Dam**—In soil conservation, a barrier built for the purpose of diverting part or all of the water from a stream into a different course.
- Ditch**—An open artificial waterway approximately parallel to the top of a cut backslope for preventing surface water from flowing over the slopes of a cut or against the foot of an embankment. Its purpose is to protect the slopes from erosion.
- Terrace**—A terrace to divert water from a terrace system.
- Divide**—The water-shed or height-of-land from which the heads of streams flow in opposite directions.
- To separate into smaller parts.
- Divining Rod**—A rod (most frequently of witch hazel, and forked in shape), used according to an old but still extant superstition for discovering mineral veins and springs of water, and even for locating oil wells.
- Division Box** (hydraulics)—A structure for dividing and diverting water into other channels. It may divide all flow pro rata, or it may divert a definite quantity, within a reasonable tolerance, regardless of the total flow.
- Gate** (hydraulics)—A structure that divides the flow between two or more laterals.
- Divisional Bonds**—This bond usually constitutes a mortgage upon the property of a single division or branch line of a road. They may or may not be guaranteed by the parent company. In case they are so guaranteed, they become a first lien upon the property actually mortgaged and a junior lien or certificate of debt as regards the guarantor corporation.
- Dobie**—A term applied to the mud cap or adobe method of secondary blasting.
- Loose term for "adobe."
- Dock**—A natural or artificial inlet or basin used by boats, including both the water and the protecting sides.
- A structure against which boats land to discharge cargoes and passengers. Synonymous with wharf and used very generally on the Great Lakes.
- A large shed used for housing airships.
- To haul an airship into its dock.
- Floating Dry**—A buoyant structure, capable of being flooded and sunk or pumped out and raised, into which vessels may be shifted in

order to lift them out of the water for inspection, scraping, painting and repairs.

**Docking Cradle**—A support for the car of an airship while it is being inflated in the shed; mostly used with rigid airships.

**Dog**—A name for various mechanical devices, tools, etc., that usually grip something. The grappling iron which lifts the monkey, or hammer, of a pile driver.

—**Holes**—In stone masonry, shallow holes drilled in a stone to afford a bite for the "dogs" or hooks, used in lifting the stone with a derrick.

—**Iron**—A short bar of iron forming a kind of cramp with its ends bent down at right angles and pointed so as to hold together the two pieces into which they are driven. Often the term "Dog Iron" is used for "Dog Hook."

**Dogtooth Spar**—A variety of calcite, with sharp-pointed crystals.

**Dolerite (rock)**—A basic hypabyssal rock of medium-grained texture, consisting of plagioclase feldspar, augite, iron ores, and frequently olivine.

**Dolly**—A snap head; a tool with an indented head for holding the head of a rivet and absorbing impact while the other head is being driven.

—A roller upon which is mounted a small frame as a truck for moving heavy loads.

—**Air**—A dolly operated by compressed air. Used between two beams.

—**Bar**—A goose-neck or horse-dolly which has an indentation for a rivet head at each end.

—**Combination**—A double-headed tool used for driving four different sizes of rivets. Usually balanced on a chain.

—**Cup**—Any dolly that has a cupped end for receiving rivet heads.

—**Flat**—A hammer-headed dolly, flat

on both faces for flattening rivet-heads.

—**Screw**—A straight dolly with a shaft that screws into the head. Used between beams for bucking up.

**Dolomite**—A magnesian limestone, composed essentially of the mineral dolomite, a double carbonate of calcium and magnesium. It is theoretically composed of 54 per cent calcium carbonate and 46 per cent magnesium carbonate.

**Dolomitic Limestone**—A limestone containing dolomite, but in which  $\text{CaCO}_3$  is dominant over  $\text{MgCO}_3$ .

**Dolomitization**—The process by which limestone may become dolomite by the substitution of magnesian carbonate for a portion of the original calcium carbonate. If the  $\text{MgCO}_3$  approximates the 45 per cent of the mineral dolomite, there is great shrinkage in bulk, leading to the development of porosity and cavities up to 11 per cent of the original rock.

**Dome**—In geology, an uplift in which the beds dip outward in all directions from a center. Oil and gas pools are frequently found beneath domes.

—The cylindrical projection above the top of a tank car for purposes of entry, filling, and emptying.

**Domestic Sewage**—That discharged from residences or institutions, and contains water-closet, laundry and kitchen wastes.

**Doric**—The first and simplest order of Greek architecture.\*

**Dortmund Tank**—A vertical sedimentation tank, usually cylindrical, in which the raw or partially treated sewage enters the lower part, flows upward and passes out near the top. The sludge is drawn before it becomes septic from the conical or hopper-shaped bottom.

**Dose**—A special charge used in a blast furnace, designed to cure furnace troubles.

- Dosing Apparatus**—The apparatus used for regulating the application of sewage or water to filters or for applying the required quantity of chemicals to sewage or water.
- Siphon**—An automatic siphon for discharging the contents of a dosing tank.
- Tank**—A tank into which raw or partially treated sewage is introduced and held until the desired quantity has been accumulated, and then discharged at such a rate as is necessary for the distribution essential to the subsequent treatment.
- Double Acting Compressor**—A machine which consists of one or more compressing units, the compression taking place on both strokes per revolution in each compressing element.
- Bowstring Truss**—A truss in which the joints of each chord lie in curves concave to each other.
- Drill**—A drill with two cutters for making countersunk holes.
- Intersection Truss**—A truss having two intersecting diagonals for each panel.
- Meridian Distance**—The sum of the perpendicular distances from the two ends of any line of a truss.
- Refined Iron**—Iron made by a process of cutting up bars of refined iron, placing the pieces in piles, then reheating and rerolling into shape.
- Riveting**—A term applied to riveted joints in which a double row of staggered rivets is used for a lap joint and two double rows for a butt joint—one double row on each side of the joint.
- Rotating Cantilever Draw**—A movable structure composed of two adjacent swing spans, the inner ends of which are mechanically connected, and the outer ends of which engage with anchorages.
- Shear**—A sliding action of tendency to slide on two different but parallel planes.
- verse to the initial, or reference, meridian.
- Suction Impeller**—(See impeller, double suction.)
- Suction Pump**—A pump equipped with a double suction impeller. (See impeller.)
- Surface Treatments**—Two separate applications of bituminous material to highway surfaces which result in the construction of a bituminous carpet coat. The first application may be a prime coat with no mineral aggregate cover, or mineral aggregate may be used in connection with each application of bituminous material. The treatment commonly designated as "Armor Coat" is essentially a double surface treatment.
- Wrench**—A wrench having a set of jaws at each end.
- Double-Row Radial Engine**—An engine having two rows of cylinders arranged radially around a common crankshaft. The corresponding front and rear cylinders may or may not be in line.
- Dowel**—A two-piece steel instrument used in lifting stone. The dowel engages the stone by means of two holes drilled into the stone at an angle of about 45 degrees pointing toward each other. The dowel is not keyed in place.
- An iron or wooden pin, extending into, but not through, two members of the structure to connect them.
- Bar**—In Portland cement concrete pavement, a bar or device, permitting expansion, requiring directed movement and capable of transmitting shear.
- Downwash**—The air deflected perpendicular to the direction of motion of an airfoil.
- Angle**—The angle through which an air stream is deflected by any lifting surface. It is measured in a plane parallel to the plane of symmetry.
- Draft** (of vessel)—The number of feet below the surface of the water

- to which a vessel is submerged; invariably marked in numerals on the stem and sternpost of a vessel.
- A line on the surface of a stone cut to the breadth of the chisel.
  - Tube** (hydraulics)—An expanding tube connecting the passages of a reaction water wheel with the tail water.
  - A tube connecting a pump or turbine with water at a lower level.
  - Drafted Stones**—In stone masonry, stones on which the face is surrounded by a draft, the space inside the draft being left rough. (See chisel draft.)
  - Drag**—An appliance with narrow blades for smoothing the surface of a road.
  - (aeronautic)—The component of the total air force on a body parallel to the relative wind.
  - Broom**—(See broom drag.)
  - Coil**—(See coil drag.)
  - Direction** (stress analysis)—The direction of the relative wind (cf. beam, chord, lift, and side directions).
  - Force, or Component** (stress analysis)—A force, or component, in the drag direction; i. e., parallel to the relative wind (cf. beam, chord, lift, and side forces).
  - Rope**—A long rope which can be hung overboard from a balloon so as to act as a brake and a variable ballast in making a landing. Sometimes called "trail rope" or "guide rope."
  - Scraper**—A crescent-shaped open bottom bucket of large capacity pulled by a cable, for cutting and moving loose materials or soils.
  - Strut**—A fore-and-aft compression member of the internal bracing system of an aircraft.
  - Wire**—(aeronautic) A wire intended primarily to resist the forces acting backward in the chord direction. It is generally enclosed in the wing.
  - Drain**—A conduit or other artificial waterway for conducting water from an area or roadway. (See storm drain.)
  - Intercepting** — (See intercepting drain.)
  - Tank**—In wood preservation, usually a horizontal, cylindrical tank so located that the surplus preservative can be drained into it by gravity upon completion of the treatment.
  - Tile**—Pipe of burned clay, concrete, etc., in short lengths, usually laid with open joints to collect and remove drainage water.
  - Drainage**—The interception and removal of water from, upon or under an area or roadway.
  - The process of removing surplus ground or surface water by artificial means.
  - A general term for gravity flow of liquids in conduits. Commonly applied to surface and ground-water.
  - Area**—The surface of the land enclosed by the divide line, from which all water flows to the stream at the point under consideration.
  - (in general sense) The area drained by a stream and its tributaries.
  - Basin**—The area from which water is carried off by a drainage system; a watershed or catchment area.
  - District**—An area in which there is an organization operating under legal regulations for financing, constructing, and operating a drainage system.
  - Draining**—Removal of a liquid by gravity.
  - Draw**—A topographic term referring to a natural depression or swale; a small watercourse.
  - The movable portion of a draw-bridge.
  - To make drawings.
  - Center Bearing**—A swing span supported on a central pivot.
  - Double Rim Bearing**—A draw span supported on two rims or a double drum.
  - Revolving**—A draw bridge which turns in a horizontal plane.

—**Span**—A movable span in a bridge over a navigable stream, to permit the passage of vessels. (See double rotating cantilever draw.)

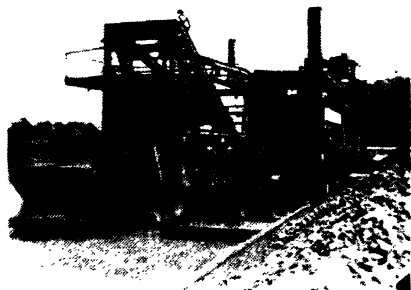
**Drawing**—The making of a plan on paper, etc. Also the plan itself.

—**Detail**—A drawing on a large scale showing all small parts, dimensions, details, etc.

—**General**—A drawing showing the elevation, plan, and cross-section of the structure; also the borings for substructure and the main dimensions.

—**Perspective**—A drawing of any structure in which vanishing points are employed.

—**Shop**—A drawing of a structure or machine showing all parts and dimensions so that the shop can actually build what is indicated on the drawing without other information.



*Photo courtesy Joseph P. Lucas  
Sand-gravel dredge, front view*

—**Working**—Any drawing showing all the parts and dimensions with other information pertinent to construction, so that whatever is shown can be built without other drawings or instructions.

**Dredge**—A machine for excavating material at the bottom of a body of water, raising it to the top and discharging it on the bank through pipe line or by conveyors, or into a scow for removal to a distant point.

—**Bucket**—(See bucket dredge.)

—**Spuds**—Vertical timbers at the corners of the boat or barge or in a well within the hull which, when resting on or driven into the bottom, hold the dredge in place.

**Dredging Tube**—The large tube of a dredging machine that operates by suction for the removal of mud, sand, etc.

**Drier**—(in paint) A material containing metallic compounds added to paints and painting materials for the purpose of accelerating drying.

**Dreikanter**—A term applied to the three-edged faceted pebbles formed by wind action in a dry climate, whether hot or cold.

**Dress**—To cut or shape a stone with tools.

**Dries, or Dry**—Seams in the rock, which are usually invisible in the freshly quarried material, but which may open up in cutting or on exposure to the weather. A quarryman's term.

**Drift**—(aerial photography) Apparent rotation of aerial photographs with respect to the true line of flight, caused by failure to orient the camera to compensate for the angle between that line and the direction in which the airplane is heading.

—**Sand and boulders deposited by glaciers.**

—**To enlarge a hole with a conical pin.**

—(in coal mining) Is a main sub-horizontal entry driven from the surface. It corresponds to an adit in metal mining.

—**Angle**—The horizontal angle between the longitudinal axis of an aircraft and its path relative to the ground.

—**Barrier**—In soil conservation, an open structure built across a stream channel to catch driftwood. It may be of any form from a simple wire fence to a barrier of

- massive piers with heavy cables strung between them.
- Bolt**—A piece of round or square metal, with or without head or point and of specified length, driven as a spike.
  - Deposit**—Any accumulation of glacial origin; glacial or fluvio-glacial deposit.
  - Pin**—A hand tool made of tempered steel with tapering ends and of a size that will permit its being pushed through a rivet hole. Used to draw together the component parts of a member or adjacent members.
  - Driftbolt**—A bolt for securing together successive layers, as of stones in a foundation or of timbers in a grillage. (See drift pin.)
  - A round bar pointed on one end, without a head, used to drive through timber caps to hold them in place on wood pile tops. (See drift bolt.)
  - Drifting**—In mining, to open a drift such as a horizontal passage underground. A drift follows the vein, as distinguished from a cross-cut, which intersects it. In coal mining, a gangway or entry above water level, driven from the surface in the seam.
  - Drill**—To bore a hole in a material with a tool revolved by a suitable mechanism. The tool itself or the apparatus holding and turning it.
  - Adamantine** — (See adamantine drill.)
  - Countersink**—A tool combining a drill and a countersink in one piece.
  - Fluted**—A drill having two longitudinal grooves or flutes on opposing sides.
  - Gang**—(See gang drill.)
  - Hand**—Any drill that is operated by hand. Usually one man operating both drill and hammer.
  - Pin**—A drill for boring pin holes in truss members.
  - Plate**—A breast-plate for hand-drilling operations.
  - Press**—A machine tool for drilling holes, consisting of a movable work table and an iron frame in which a vertical revolving spindle is mounted to carry the drill-bit.
  - Radial**—A machine rock drill in which the drill tool is fastened to a radial arm.
  - Shot**—(See adamantine drill.)
  - Twist**—A cylindrical drill having two parallel, spiral grooves on opposing sides and the point sharpened to an obtuse angle.
  - Drilling Line**—A wire rope used to suspend the cutting tools for drilling deep wells.
  - Drillings**—The cuttings, or shavings, arising during the process of drilling. Also the holes that are drilled in the ground.
  - Drip Flap**—A strip of fabric attached by one edge to the envelope of an aerostat so that rain runs off its free edge instead of dripping into the basket or car. It also assists in keeping the suspension ropes dry and non-conducting. Also called "drip band" or "drip strip."
  - Stone**—A porous stone, either artificial or natural, for filtering water.
  - Drips**—In heating terminology, connections for draining the condensate from mains, base of risers, etc.
  - Driver** (of vehicles)—Every person who manipulates or is in actual physical control of a vehicle.
  - Drop** (hydraulics)—A structure for dropping the water in a conduit to a lower level and dissipating its surplus energy; a fall. A drop may be inclined or vertical; the former is sometimes called a chute.
  - (of beam)—A term used in testing materials to indicate that a test piece has passed the yield point as shown by the sudden dropping of the weighing beam of the testing machine.
  - Line**—(See line drop.)
  - Manhole**—(See well hole.)
  - Forged**—Forged between dies by

- means of a drop hammer or drop press.
- Hammer**—A type of pile driver hammer which is raised by means of a hoisting engine and permitted to drop by gravity on the head of the pile.
- Pipe Line**—(See pipe line, drop.)
- Drop-Down Curve**—In hydraulics, a particular form of surface profile assumed by a stream above a point at which the depth of flow is decreased below the normal depth. The depth is greater than Belanger's critical depth but less than the normal depth, and throughout the extent of the profile the velocities increase downstream.
- Dropped Panel**—The structural portion of a flat slab which is thickened throughout an area surrounding the column capital.
- Droppers**—In paving brick operations, a term referring to the men who set the paving brick in place on the cushion or bed course.
- Drove**—In stone masonry, dressed on the face so as to have a series of small parallel ridges and valleys.
- Drum, Conical**—(See conical drum.)
- Drum Gate**—An engineering term referring to a movable watertight gate constructed in the form of a sector of a circle and hinged at the apex. The arc face effects a water seal with the edge of a recess into which the gate may be lowered. The gate is raised and held up by the pressure of water admitted to the recess from the headwater. It is lowered by closing the inlet port to the recess and draining the water from it.
- Screen**—One in the form of a cylinder or cone, consisting of perforated plates or a wire mesh which rotates on a horizontal axis.
- Drumlin**—Is a term applied to rounded oval hills of clay and boulders formed by the action of glaciers.
- Druse**—In geology, a cavity whose walls are encrusted with crystals of the same minerals as those of the enclosing rock.
- Dry Ice**—Pure carbon dioxide in the solid form. The temperature averages about  $-109^{\circ}\text{F.}$  and the specific gravity is 1.56.
- Gas**—Natural gas obtained from sands that produce gas only. It does not contain oil vapors.
- Dry Masonry**—Masonry in which stones are built up without the use of mortar.
- Process**—In the manufacture of Portland cement, the raw materials (limestone, clay, etc.) are crushed, dried, ground and burned.
- Returns**—A heating term referring to the return mains or branches run above a water line of a boiler, receiver or seal to which they connect.
- Weather Flow**—Normal flow of sewage when not modified by precipitation, thaws, or increased run off.
- Weight of an Engine**—(See engine, dry weight of.)
- Dry-bulb Temperature**—In heating and air conditioning, the temperature of air as indicated by a thermometer of standard type.
- Dry-Press Process**—A method of forming clay wares by using slightly moistened clay in pulverized form and pressing it into steel dies.
- Drying Oil**—An oil which possesses to a marked degree the property of readily taking up oxygen from the air and changing to a relatively hard, tough, elastic substance when exposed in a thin film to the air.
- Dubb**—To cut the end of a stick to a bevel around the edge. Used in piling.
- Ductility**—That physical property of a material which permits permanent distortion without rupture. The percentages of elongation and of reduction of area are measures of ductility and usually vary in-

- versely with the tensile strength.
- That physical property of a material which permits it to undergo considerable extension without rupture beyond the elastic limit without any great increase in applied load.
  - Dummy Joint**—In Portland cement concrete pavement, a kind of contraction joint where movement causes the formation of a crack at a determined location.
  - Dumpy Level**—A surveyor's level having a short telescope with level tube attached, rigidly fixed to a conical center pin capable only of rotary movement in a horizontal plane.
  - Dune**—A mound or ridge of loose sand piled up by the wind; common where sand is abundant, as along shores of bodies of water and in some desert areas.
  - Sand**—Areas of wind-drifted sand in dunes, hummocks, and ridges, usually free from vegetation and undergoing active erosion and re-deposition by winds.
  - Dunite**—In petrology, a peridotite consisting essentially of olivine and often containing chromite.
  - Duplex Compressor**—A machine for compressing air or gas in which two straight line units are placed parallel on one common crank shaft.
  - Pump**—A power-driven reciprocating pump having two liquid pistons or their equivalent single or double acting plungers.
  - Durability**—Time resistance to disintegration or deterioration.
  - Duraco**—This is a Texas rock asphalt like the Alabama product. It is about 75 per cent rock asphalt, and 5 per cent trap rock, with a small amount of flux oil and other ingredients added to make the mixture easy to handle. It can be laid either hot or cold, depending on the bitumen fluxed with it.
  - Dust**—Fine particles of sand, clay, loam, or other earthy matter which will pass through a No. 50 screen, so attenuated that they can be raised and carried off by air currents.
  - The product of the crusher passing through a fine sieve.
  - Cupel**—(See cupel dust.)
  - Layer**—Material applied to a roadway for temporarily preventing the formation or dispersion under traffic of distributable dust.
  - Laying Oil**—An oil of sufficiently low viscosity to be applied without preheating. It may be either a slow curing liquid asphaltic product or a non-volatile petroleum distillate containing no asphalt.
  - Dusting**—In cement technology, this refers to the spontaneous pulverization which sometimes occurs in clinker of certain compositions or following certain heat treatments due to the change in the dicalcium silicate from the beta to gamma modification. This change results from a 10 per cent increase in volume which produces the effect noted.
  - Duty of Water**—The quantity of irrigation water used under different standards of practice. It will vary from a large use under crude practice to small use approaching consumptive use under good practice. It is simply the measure of the use of water and may be distinguished as head-gate or gross duty, lateral duty, duty at the farms, or net duty, and crop duty for different crops. It may be expressed in depth of water on the land, as a rate of flow per acre for a given time, or as the area per unit of flow for a given time.
  - Dynamic Deflection**—The additional deflection caused by the live load being in motion.
  - Factor** (stress analysis)—The ratio between the load carried by any part of an aircraft when accelerating and the corresponding basic load.

**Dynamic Head, Total**—(See head, total dynamic.)

—**Lift**—The component of the total aerodynamic force on a body perpendicular to the relative wind.

—**Load**—(See load, dynamic.)

—**Metamorphism** — Metamorphism produced by earth movements in regions of great dislocation, shear or crushing of rocks. Distinguished from chemical processes, but the former are seldom unattended by the latter.

—**Pressure** — The product  $\frac{1}{2}\rho V^2$ , where  $\rho$  is the density of the air and  $V$  is the relative speed of the air.

—**Stability**—That property of an aircraft which causes it, when its state of steady flight is disturbed, to damp the oscillations set up by the restoring forces and moments and gradually return to its original state.

—**Suction Head**—Dynamic suction head exists where the pressure measured at the suction nozzle of the pump, corrected to the centerline of the pump, when pumping the required capacity, is above atmospheric pressure.

—Dynamic suction head, as determined on test, is the reading of a gauge in feet of the liquid connected to the suction nozzle of the pump corrected for the distance between the centerline of the gauge and the centerline of the pump. The gauge connecting line must be entirely filled with water.

—**Suction Lift**—Dynamic suction lift exists where the pressure measured at the suction nozzle, and corrected to the centerline of the pump, when pumping the required capacity,

is below atmospheric pressure.

—Total dynamic suction lift, as determined on test, is the reading of a mercury column connected to the suction nozzle of the pump, corrected for the vertical distance between point of attachment of mercury column and the centerline of the pump. The gauge line from point of attachment at the pump to the mercury column must be entirely free of water.

**Dynamite**—An explosive mixture of nitroglycerine and sawdust. "Straight" dynamite consists of nitroglycerine with wood pulp and nitrate of soda. The three varieties of dynamite are: Ammonia, nitroglycerine, and gelatin; the first two carry a maximum of 60 per cent active agent generally, and gelatin may carry practically 100 per cent and is best suited for wet work; nitroglycerine is the fastest. Forty per cent active agent (40 per cent dynamite) is most common in highway usage. Commercial non-freezing dynamite is prepared from nitroglycerine. "High" explosives are generally straight nitroglycerine, T.N.T. and nitro-cotton, the first and the last being extremely sensitive.

**Dynamo**—In electricity, a machine for generating electricity by causing coils of copper wire to rapidly cut magnetic lines of force.

—A generator of electricity.

**Dynamometer**—A name given to a variety of apparatus for measuring the power of an engine or motor.

—**Hub**—(aeronautic) A device built into a propeller hub for measuring the engine thrust and/or torque.

# E

**Earnings, Net**—The income of a company after deducting operating and other expenses, but usually before deducting Federal taxes, bond interest or dividends.

**Earth**—The softer materials of the lithosphere as distinguished from firm rock. Its basic constituents are the products of rock disintegration, glaciation, and erosion, consisting of boulders, cobbles, pebbles, sand, silt, and clay, the latter in both particle and colloidal form.

—**Bog**—(See bog earth.)

—**Currents**—Electric currents flowing through the earth, caused by a differential of potential at different parts.

**Earth Dam**—In soil conservation, a barrier composed of earth, clay, sand, or sand and gravel, or a combination of earth and rock.

—**Flow**—The moderately rapid flowage of large masses of slippery earth materials or the movement of blocks of the land surface floating on a liquid substratum; common from the edge of clay terraces as in certain glaciated valleys; also important in some mountain regions of shale bedrock.

—**Metal**—Any metal whose oxide is classed as an earth.

—**Road**—A roadway composed of natural earthy material.

**Earth-Flax**—(See asbestos.)

**Earth-Inductor (or induction) Compass**—A compass the indications of which depend on the current generated in a coil revolving in the earth's magnetic field.

**Earthquake Powder**—An explosive mixture containing 79 per cent nitre, and 21 per cent charcoal.

**Easement or Easement Deed (right of way)**—A grant of an indefinite right of use, for a certain purpose, at the will of the grantee.

**Ebb Current (tides)**—The current that sets seaward or down stream.

**Ebonite**—A tough, hard, black substance composed essentially of India rubber and sulphur, which possesses high powers of insulation and of specific inductive capacity.

**Eccentric**—Out of center. A disk mounted out of center on a driving shaft and surrounded by a collar or a strap connected with a rod.

—**Signal** — (triangulation) Signal placed at some point other than directly over the triangulation station, and not in line with the station and the instrument.

—**Station** — (triangulation) Point where an instrument is placed for the measurement of horizontal angles when it is not practicable to set up directly over the actual station.

**Eccentricity of Circles**—Failure of the inner center, or the inner vertical axis, of a transit to coincide with the center of the graduated circle.

—The amount by which the two fail to coincide, expressed as seconds of arc on the circle.

**Echinus**—In architecture, a quarter round moulding, as ovolo.\*

**Echo**—In acoustics, a wave which has been reflected or otherwise returned with sufficient magnitude and delay to be perceived in some manner as a wave distinct from that directly transmitted.

—**Flutter**—(See flutter echo.)

—**Multiple**—(See multiple echo.)

**Eclogite**—A schistose metamorphic rock, consisting of a light-green pyroxene, actinolite and garnet.

**Economic Depth**—That depth of truss or girder which when everything is considered, will give results that are satisfactory from all stand-

- points and involving the least expenditure of money for properly combined first cost, operation, maintenance, and repairs.
- Efficiency**—The ratio of actual performance to an ideal or standard performance.
- Mineral**—Any mineral having a commercial value.
- Economics**—The science that investigates the conditions and laws affecting the production, distribution and consumption of wealth, or the material means of satisfying human desires; political economy.
- Eddy Loss**—The energy lost (converted into heat) by swirls, eddies, and internal impact as distinguished from losses due to viscosity and normal turbulence.
- Edge, Leading**—(See leading edge.)
- Trailing**—(See trailing edge.)
- Effective Angle of Attack**—(See angle of attack for infinite aspect ratio.)
- Area** (of concrete)—The area of a section which lies between the centroid of the tensile reinforcement and the compression face of a slab or beam.
- Area** (of reinforcement)—The area obtained by multiplying the right cross-sectional area of the metal reinforcement by the cosine of the angle between its direction and that for which the effectiveness of the reinforcement is to be determined.
- Aspect Ratio**—The aspect ratio of an airfoil of elliptical plan form that, for the same lift coefficient, has the same induced-drag coefficient as the airfoil, or the combination of airfoils, in question.
- Depth**—The perpendicular distance between the gravity lines of a truss or girder.
- Helix Angle**—The angle of the helix described by a particular point on a propeller blade as the airplane moves forward through air otherwise undisturbed.
- Sound Pressure**—In acoustics, the effective sound pressure at a point is the root mean square value of the instantaneous sound pressure over a complete cycle, at that point. The unit is the dyne per square centimeter.
- Span**—The true span of a wing less corrections for tip loss.
- Temperature**—In heating and air-conditioning, an arbitrary composite index of the effect on the human body of a combination of temperature, humidity and movement of air. It has been experimentally determined and is used as an index to air conditions which affect human comfort.
- Efficiency**—The ratio of the actual condition or method of a thing, material or machine to a theoretical condition or method of a standard from which all losses have been eliminated. The term is often applied to riveted joints in comparing their strength with that of the solid plate, or in comparing the actual output of a machine with a theoretical output; or the actual output of energy compared with theoretical input of energy.
- Economic**—(See economic efficiency.)
- Mechanical**—(See mechanical efficiency.)
- Overall**—(See overall efficiency.)
- Propeller**—(See propeller efficiency.)
- Propulsive**—(See propulsive efficiency.)
- Pump**—The efficiency of a pump is the ratio of energy converted into useful work to the energy supplied to the pump; that is, the ratio of the water or liquid horsepower output to the brake horsepower input, or
- $$\text{Efficiency in per cent} = \frac{\text{whp}}{\text{bhp}} \times 100$$
- bhp = brake horsepower input to pump.
- The water or liquid horsepower is

to be computed from the following formula:

$$\text{whp.} = \frac{\left( \frac{\text{Pounds of liquid}}{\text{pumped per min.}} \right) \times \left( \frac{\text{Total dynamic head in ft. of liq.}}{33000} \right)}{33000}$$

When the weight of water is 62.318 lb. per cu. ft. (density at standard temperature of 68 deg. Fahr.)

$$\text{whp.} = \frac{\text{gpm} \times (\text{total head in feet})}{3960}$$

where gpm = gallons per minute

If the pump is handling a liquid other than water or water at a temperature resulting in a different weight per cubic foot than 62.318, the above formula must be corrected for the specific gravity of the liquid so that

$$\text{whp.} = \frac{\text{gpm.} \times (\text{total dynamic head in feet}) \times S}{3960}$$

Where S = specific gravity of liquid referred to 68 degree F. water.

If the total dynamic head is expressed as pounds per square inch, the formula for theoretical horsepower irrespective of specific gravity of the liquid becomes

$$\text{whp.} = \frac{\text{gpm.} \times (\text{total dynamic head in lb. / sq. in.})}{1714}$$

—**Volumetric**—(See volumetric efficiency.)

**Effloresce**—To change on the surface or throughout to a whitish, mealy or crystalline powder from the loss of water of crystallization on exposure to the air.

**Efflorescence**—A white crust that often forms on the face of masonry, due to the leaching of soluble salts out of the mortar.

**Elastic Center**—(See center, elastic.)

—**Failure**—Permanent distortion of a body or piece under load.

—**Limit**—In tensile and compressive tests, the stress at which the initial permanent elongation or shortening of the gauge length occurs, as shown by an instrument of high precision. In transverse tests, the extreme fiber stress at which the initial appreciable permanent deflection occurs as determined with deflectometer.

—**Resilience**—The energy recovered or work done by an elastic body when a deforming stress is released at the elastic limit.

—**Resilience, Modulus of**—The energy given up per unit of volume when the stress on a material is released.

—**Strength**—The limiting stress of a material above which the material will suffer appreciable permanent distortion.

—**Unit, Resilience**—(See unit elastic resilience.)

**Elastica**—(See hydrostatic catenary.)

**Elasticity**—That property of a material which permits the strain resulting from an applied stress to disappear entirely upon removal of the applied stress.

**Elaterite**—A variety of bitumen which when fresh is characterized by being elastic, but which, on exposure, becomes hard and brittle.

**Electric Annealing**—Using heat produced by electricity for the annealing process.

—**Circuit**—The path in which an electric current circulates from a starting point through a conducting path back to the starting point.

—**Coil**—In electricity, a convolution of insulated wire through which an electric current may be passed.

—**Furnace Process**—The process of making steel from steel scrap or from steel scrap and iron ore with limestone as a flux in a furnace, usually of the rocking or tilting type, built of steel plates and lined with fire brick or other refractory materials, in which the source of heat is a low voltage electric current of high amperage. The furnace lining may be either acid or basic.

—**Potential**—In electricity, the power of doing work.

**Electrical Adhesion**—The adherence of bodies resulting from dissimilar electrostatic charges being present in them.

—**Resistance**—That property of a

- body or conductor by virtue of which the passage of an electric current is opposed.
- Electricity, Accumulating**—(See accumulating electricity.)
- Static**—(See static electricity.)
- Electrochemical Equivalent**—Of an ion is the mass liberated by the passage of unit quantity (one coulomb) of electricity.
- Electrolysis**—The process whereby an electric current passing from an electrode to an electrolyte or vice-versa, causes chemical changes to take place in the electrolyte. Electrolysis is also the process of decomposition which is aided by the passage of an electric current.
- Electrolytic Cell**—A cell or vessel containing an electrolyte, in which electrolysis is carried on.
- Electrometer**—In electricity, an instrument for measuring differences in the potential.
- Electronite**—An explosive mixture containing 75 per cent ammonium nitrate and 5 per cent barium nitrate with wood meal and starch.
- Element**—That of which anything is in part compounded, which exists in it and which is itself not decomposable into parts of different kinds.
- Elevation**—Vertical distance above or below datum to point in question.
- (of curves) (superelevation)—In railway use, the vertical distance that the outer rail is above the inner rail.
- The projection of an object on a vertical plane, used in drafting.
- Or Height**—The distance of any given point above or below an established plane or datum.
- Elevator**—(aeronautic) A movable auxiliary airfoil, the function of which is to impress a pitching moment on the aircraft. It is usually hinged to the stabilizer.
- Angle**—The angular displacement of the elevator from its neutral position. It is positive when the trailing edge of the elevator is below the neutral position.
- Rope**—Wire rope used for supporting and moving the elevator cage or platform.
- Ellipse**—A curve such that the sum of the distances from two fixed points, called the foci, to any point on the curve is a constant.
- Elongation**—The amount of stretch under specified stress.
- Relative**—(See relative elongation.)
- Ultimate**—(See ultimate elongation.)
- Eluvial**—Formed by the rotting of rock in place to a greater or less depth.
- Embankment (or fill)**—A bank of earth, rock or other material constructed above the natural ground surface.
- Protector**—An inlet for directing the water from the surface of a roadway or embankment into a spillway generally down the slope of the embankment.
- Strut**—A limited amount of fill between a firm geological structure and the outer slope of a much greater embankment yardage placed on original ground of a considerable transverse slope. The embankment strut serves the purpose of loading the original ground at the toe of the larger embankment, and also to take thrust of any movement in the larger embankment due to instability developing in the original ground upon which embankment is placed.
- Embayment**—A deep depression in a shore line forming a large open bay.
- Emergency Flotation Gear**—A device attached to a landplane to provide buoyancy in case of an emergency landing on the water.
- Emery (rock)**—A granular rock of a dark gray to black color, consisting mainly of grains of gray or bluish corundum, often mixed with magnetite, and associated with other minerals.
- Emissive Power, Monochromatic**—

(See monochromatic emissive power.)

**Empennage**—(See tail, airplane.)

**Empirical**—Pertaining to or derived from experience or experiments.

—**Coefficient**—A coefficient established by experience or observation rather than by scientific deduction from fundamental principles.

—**Formula**—A formula pertaining to or derived from experience or experiments.

**Empty Cell Treatment**—In wood preservation, a treatment in which the cell walls in the treated portion of the wood remain coated with preservative, the cells being empty or only partially filled.

—**Weight**—The structure, power plant, and fixed equipment of an aircraft. Included in this fixed equipment are the water in the radiator and cooling system, all essential instruments and furnishings, fixed electric wiring for lighting, heating, etc. In the case of an aerostat, it also includes the amount of ballast that must be carried to assist in making a safe landing.

**Emscher Tank**—(See Imhoff.)

**Emulsification**—The process of formation of emulsions.

**Emulsified Asphalt**—An emulsion of asphalt cement and water containing a small amount of emulsifying agent. (Emulsions are heterogeneous systems containing two normally immiscible liquid phases, one of which is dispersed as fine droplets or globules in the other.)

**Emulsion**—In wood preservation, a mixture wherein creosote or other oils is minutely dispersed in water or a solution of a salt in water.

—In bituminous material, see bituminous emulsion.

—A combination of water and oil material made miscible through the action of a saponifying or other agent.

**Enamel**—A special kind of paint

which flows out to a smooth coat when applied and dries to a smooth, glossy, relatively hard, permanent solid when exposed in a thin film to the air. An enamel always contains pigment and has considerable hiding power color. Some enamels dry to a flat or eggshell finish instead of a gloss finish.

**End Box**—Gussets, shoe cover plates and other details at shoe pins or truss spans.

—**Chipping**—The loosening of the metal on the top or gage side of the end of a rail.

—**Contractions** (hydraulics) — The end walls of a weir notch that does not extend across the entire width of the channel of approach; also the contraction of the nappe or jet caused by these walls.

—**Finish**—A structural steel device designed to span the opening in the roadway between the superstructure and back walls or between adjacent spans.

—**Point**—The highest temperature reading observed on the distillation thermometer during the distillation procedure conducted in accordance with the Standard Method of Tests for Distillation of Gasoline, Naphtha, Kerosene and Similar Petroleum Products of the American Society for Testing Materials.

—**Post**—The post at the end of a truss.

—**Reaction**—The reaction set up at the end of a beam, girder, or truss by the loads thereon plus its own weight.

**Endless Rope**—A wire rope having its two ends spliced together, thus forming a continuous circuit.

**Endurance Limit**—The greatest unit stress in a material that can be repeated an indefinitely large number of times without causing the material to rupture. Also called fatigue strength.

**Energy**—The capacity to perform

work; kinetic energy is that due to motion; potential energy is that due to position or condition. Total energy is represented by the sum of potential and kinetic energies.

—**Conservation of**—(See conservation of energy.)

—**Density, Sound**—(See sound energy density.)

—**Flux, Sound**—(See sound energy flux.)

—**Gradient**—The slope of a line joining the elevations of the energy head of a stream.

—**Head**—The elevation on the hydraulic gradient at any section plus the velocity head.

—**Line**—(hydraulics) A line joining the elevations of the energy heads of a stream when referred to the stream bed. The energy line lies above the water surface at any cross section, a vertical distance equal to the velocity head at that cross section.

—**Potential**—(See potential energy.)

**Engine Cowling**—A removable covering placed around all or part of an airplane engine.

—**Diesel**—(See Diesel engine.)

—**Dry Weight of an**—The weight of an engine exclusive of fuel, oil, and liquid coolant.

—**Four-Cycle**—An internal combustion engine receiving a power impulse in each cylinder at each second revolution.

—**Gas**—An internal combustion engine using natural or manufactured gas as fuel.

—**Gasoline**—An internal combustion engine using gasoline, naphtha or other volatile petroleum products as fuel.

—**Internal Combustion**—A prime mover in which the power is derived from the expanding gases during combustion of the fuel compressed and ignited in a cylinder and acting directly against the piston.

—**Oil**—An internal combustion en-

gine which is started and operated on a non-volatile oil of medium low Baume degrees, the fuel being ignited from a surface heated by previous combustion of the fuel.

—**Weight per Horsepower**—The dry weight of an engine divided by the rated horsepower.

**Engineering Report**—(railway valuation) A statement compiled and published by the Interstate Commerce Commission, showing the physical property of a railway (except "Land"), classified according to ownership and use by units, unit prices and totals, purporting to give the cost of Reproduction New and Reproduction Less Depreciation of a railway at a given date of valuation.

**English Bond**—That disposition of bricks in a structure in which each alternate course is composed entirely of headers or of stretchers.

**Enstatite**—A variety of pyroxene with less than 5 per cent FeO. It is also used as a prefix to the names of rocks that contain the mineral.

—An orthorhombic pyroxene,  $Mg-SiO_3$ , containing 60 per cent silica, and 40 per cent magnesia.

**Entablature**—In architecture, the upper portion of an order, composed of the architrave, frieze and cornice.\*

**Entasis**—In architecture, the curving profile of a column, designed to overcome the optical illusion which gives a shaft composed of straight sides the appearance of curving inward.\*

**Entrance Cone**—That portion of a wind tunnel from which the air flows to the experiment chamber.

—**Culvert**—A culvert placed in a drainage channel to permit easy access to adjacent property.

—**Head**—(hydraulics) The head required to cause flow into a conduit or other structure; it includes both entrance loss and velocity head.

- Loss**—(hydraulics) The energy lost at the inlet to a conduit or structure; usually expressed as a "head."
- Entry, Cross**—(See cross entry.)
- Envelope**—(1) The outer covering of an aerostat, usually of fabric. (2) The bag containing the aerostatic gas of a free balloon, kite balloon, or nonrigid airship.
- Eocene**—In the usage of the U. S. Geological Survey, the earliest of the epochs into which the Tertiary period is divided; also the series of strata deposited at the same time.
- Eon**—A period of existence; an age; an infinite space of time. The term is used by some geologists to denote any one of the grand divisions of geological time.
- Ephemeral Stream**—A stream which flows in direct response to precipitation.
- Ephemeris**—An astronomical almanac.
- Epicenter**—That part of the earth's surface directly above the origin of an earthquake.
- Epidiorite**—A name sometimes applied to dikes of diabase, whose augite is partly altered to green hornblende.
- Epidosite**—In petrology, a term applied to altered igneous rocks, or veins traversing them, essentially containing epidote and quartz.
- Epidote**—A hydrous complex silicate containing alumina, iron, silica, and calcium.
- Epoch**—Generally, that part of geologic time during which a formation or group of strata was deposited.
- Of Tides**—The phase or time of occurrence of high water reckoned from a fixed time origin.
- Equalizer**—A culvert placed where there is no channel but where it is desirable to have backwater or standing water at equal elevations on both sides of a fill.
- In heating terminology, a pipe for equalizing the pressure between two points in a system.
- Drip**—In heating terminology, a drip without trap or other obstruction for draining the condensate from one point to another, and for equalizing the pressures between these two points.
- Equant**—Those textures of igneous rocks that consist of equidimensional crystals.
- Equatorial Tides**—The tides occurring when the moon is on, or close to the plane of the earth's equator (zero declination).
- Equilibrium Diagram**—(See phase diagram.)
- Equipment**—In railroading, rolling stock, floating equipment and highway vehicles devoted to common carrier's service.
- Machinery and tools for doing work.
- Completion Report**—(railroad valuation) A record prescribed by Valuation Order No. 3, Second Revised Issue, showing for equipment detailed information with respect to additional units placed in service, withdrawals therefrom, additions and betterments thereto, and the costs chargeable and creditable to the accounts of the carrier as a result thereof.
- Equity**—A company's equity is the difference between the value of its assets and its bonded indebtedness. Ownership.
- Equivalent, Cone, Pyrometric**—(See pyrometric cone equivalent.)
- Direct Radiation**—In heating construction, that amount of heating surface which will give off 240 b.t.u. per hour. It is used for measuring the capacity of radiators, convectors, and boilers as an alternate for their output in b.t.u. By definition equivalent direct radiation applies to steam temperatures, but custom employs an equivalent direct radiation for hot water radiation equal to 150 b.t.u. per hour. Unless hot water radiation is spe-

- cified, E.D.R. always refers to steam heating equipment.
- Electrochemical**—(See electrochemical equivalent.)
  - Gram**—(See gram equivalent.)
  - Hydrogen**—(See hydrogen equivalent.)
  - Monoplane**—A monoplane wing equivalent as to its lift and drag properties to any combination of two or more wings.
  - Rail Steel**—(See rail steel equivalent.)
  - Wing** (stress analysis)—A wing of the same span as the actual wing, but with the chord at each section reduced in proportion to the ratio of the average beam load at that section to the average beam load at the section taken as the standard.
- Era**—In geology, in general a large division of geologic time; specifically, a division of geologic time of the highest order, comprising one or more periods. The eras now generally recognized are the Archeozoic, Proterozoic, Paleozoic, Mesozoic, and Cenozoic.
- Erecting Bill**—A bill for material for a bridge, so arranged as to facilitate the finding and placing of members during erection.
- Erection**—The assembling of the members of a bridge in the field and making the necessary permanent connections.
- Car**—A car specially fitted with a derrick and accessories, used for the erection of bridges.
  - Stress**—Stress induced by loads applied during the erection of a structure.
- Erg**—The unit of work in the C.G.S. system. It is the work done by a force of one dyne acting through a distance of one centimeter.
- Erosion**—The scouring, gnawing or wearing away of soil or rock by wind or water or of any conduit bottom, caused by the flow of water and sand, gravel, boulders or other material moved along by the water. Wear caused by hydraulic or wind traffic.
- Control**—In soil conservation, the application of necessary measures to regulate accelerated erosion.
  - Geological**—The wearing away of portions of a rock by such natural agencies as wind, stream or ice action.
  - Ratio**—In soil physics, the quotient obtained by dividing the dispersion ratio by the ratio of colloid to the moisture equivalent.
- Erratic**—A name often given to transported boulders. Loose gravel and stones on the earth's surface, including what is called drift.
- Error** (of a single measurement)—The difference between a measured value and the true value. The algebraic sign is opposite to that of the correction; it is taken in the sense,  $\text{error} = \text{measured value} - \text{true value}$ . See Correction.
- of Traverses**—See Closure, Error of.
  - Residual**—The differences between measured values and the most probable value.
- Eruptive**—A bursting movement of one material through another. In geology, a movement of rocks that have burst through other rocks in a molten state, or that have been thrust up bodily.
- Escape**—(hydraulics) A waterway for discharging the entire flow of a stream.
- A wasteway in a canal.
- Escarpment**—A cliff or relatively steep slope separating level or gently sloping tracts.
- Esker**—In geology, long narrow ridges of sand and gravel with steeply sloping sides and often a winding outline.
- Essential Minerals**—The essential constituents of a rock are those minerals whose presence are necessary in it by definition.
- Essexite**—A name derived from Essex County, Mass., and applied to a peculiar rock among the neph-

lite-syenites, the diorites and the gabbros. It contains labradorite, orthoclase, nephelite or sodalite, together with augite, biotite, and olivine.

**Estimate** (noun)—A statement showing probable cost and/or probable quantities of a proposed piece of work.

—(verb)—The act of making an estimate.

—**Final**—An estimate made from final checked quantities showing work performed and material furnished upon which final payment is made.

—**Progress**—An estimate made from time to time showing work performed or material furnished as the work progresses.

**Estuary**—A bay, as the mouth of a river, where the tide meets the river current.

**Etching**—In cement technology, a treatment of a polished section of cement clinker with some solvent which will differentially react with the cement compounds and thereby permit a more satisfactory microscopic examination of the surface.

—A process of engraving in which the lines are produced by the action of an acid or mordant.

—**Reagent**—A substance or reagent used to reveal the structure of a metal or alloy causing a difference in the appearance of different constituent parts or different grains.

**Eudiometer**—An instrument for the volumetric measurement and analysis of gases.

**Eurite**—A rock composed essentially of quartz and feldspar.

**Eustatic**—Pertaining to or designating a land area which undergoes neither elevation nor depression.

**Eustyle**—In architecture, treatments employing  $2\frac{1}{4}$  diameters clearance between adjacent columns.\*

**Eutaxitic**—A name for banded volcanic rocks.

**Eutectic**—A composition in which

two or more compounds crystallize simultaneously.

**Evaporation**—The process by which water passes from liquid or solid state to vapor.

—Vaporization of a fluid or solid.

**Evapo-Transpiration**—Combined loss of water from soils by evaporation and plant transpiration.

**Evergreen**—A plant that does not shed or drop its foliage noticeably each year.

**BROAD-LEAF EVERGREEN**—Evergreens that have a broad, rather thickish leaf; rhododendron, laurel, etc.

**NARROW-LEAF EVERGREEN**

—Called "needle" evergreens, such as pines, spruces, hemlock.

—**Tree**—In roadside development, a tree remaining verdant through the winter, or retaining leaves unwithered until the next season.

**Excavation** (or cutting)—(a) The cutting down of the natural ground surface; (b) the material taken from cuttings, borrow pits or foundation pits; (c) the space formed by removing material.

**Exfoliation**—(of concrete) A type of disintegration consisting of a splitting of thin sheets of concrete at either edge or surface. A common form appears at the edges either vertical or horizontal, where two exposed surfaces meet.

—**Rock**—The peeling of a rock surface in sheets owing to changes of temperature or to other causes.

**Existent Corner**—A corner whose position is evidenced by a monument or its accessories as described in the field note record, or whose location can be identified by the aid of acceptable testimony.

**Exhaust-Collector Ring**—A circular duct into which the exhaust gases from the cylinders of a radial engine are discharged.

**Exit Cone**—That portion of a wind tunnel into which the air flows from the experiment chamber.

**Expanding Reamer**—A reamer hav-

ing a device that can be expanded after its insertion in a hole so as to make an undercut.

**Expansion Bit**—A drill bit that may be adjusted for holes of various sizes.

—**Bolt**—Any bolt similar to the "Brohard expansion bolt." (See bolt, expansion.)

—**End**—The movable end of a structure, trestle, span, truss, etc.

—**Factor**—A constant representing the change in volume of a liquid due to a change of 1 degree in its temperature.

—**Joint**—A separation of the mass of a structure, usually in the form of a designed separation filled with an elastic material, which will provide an opportunity for slight movement in the structure. Sometimes called a contraction joint.

**Experiment (or Test) Chamber**—The central portion of a wind tunnel, where aircraft models or other objects are tested.

**Explosives**—Explosives are solid, liquid, or gaseous mixtures or chemical compounds, which by chemical action generate suddenly large volumes of heated gas. The energetic action of an explosive largely depends on its chemical change.

**Exposure Station**—(photographic mapping) The point in space, in the air or on the ground, at which a photograph is made. Specifically, the space coordinates of the rear nodal point of the camera lens.

**Extended Bond**—Bond which is merely extended for a certain period, without retiring or refunding the old issue. The rate of interest may be higher or lower than originally, all changes of this character being stamped upon the face of the bond and new coupons issued to the holder.

**Extension Handles**—In railway use, lifting handles applied to track motor cars or other light work equipment so designed that they pull out

from the body of the car or equipment. Facilitates the removal of equipment from track by increasing the leverage obtained.

**Exterior Orientation**—(photographic mapping) The re-establishment of the relation between a photograph and the earth's surface at the time of exposure. In aerial photography its elements are the swing, the tilt, and the azimuth of the principal plane. In terrestrial photography, its elements are the horizontal angle between the optical axis of the camera and the base line, and the vertical angle between the optical axis and the horizontal ground plane. See, also, Orient.

**External Distance**—The distance from the vertex of a circular curve to the middle point of the curve.

**Extensometer**—An apparatus for measuring minute degrees of expansion or contraction in metal bars under the influence of temperature or under stress.

**External Aileron**—A separate airfoil mounted clear of the wing surfaces of an airplane, but usually attached to them and deflected for lateral control.

**Extrados**—The outer or convex surface of an arch. The upper surface of the voussoirs when in position.

**Extra Work**—Additional construction items which are not included in the regular contract; extras.

**Extreme Fiber Stress**—In members subjected to bending, the intensity of stress on the fiber (or elementary strip) farthest removed from the neutral axis.

**Extrusive**—A term applied to a movement of material contained between two fairly parallel faces where the contained material pushes out from the surface.

**Eye**—A loop spliced in the end of a wire rope.

—Holes drilled on the center line at each end of a bar.

- Bar**—A bar with an eye at either end or each end.
- Bar Dog**—A special pair of tongs for lifting and moving eye-bars.
- Bar Upsetter**—A machine for enlarging the end of a plain bar sufficiently to permit the forming of an eye that will develop the full strength of the bar.
- Loop**—An eye on the end of a rod or square bar elongated in the form of a loop.

# F

- Fabric**—The shape and arrangement of the crystalline and non-crystalline minerals in an igneous rock.
- BALLOON FABRIC**—The finished material, usually rubberized, of which balloon or airship envelopes are made.
- GAS-CELL FABRIC**—The fabric used in making gas cells for rigid airships.
- GOLDBEATERS-SKIN FABRIC**—A fabric consisting of a layer of light, fine, strong cloth, usually cotton, to which one or more layers of goldbeaters skin have been cemented.
- Fabrication**—The act or process of framing and fitting rolled steel shapes for structures. The putting together of parts of a structural steel construction and riveting them.
- Facade**—The elevation of a building.\*
- Face** (in welding) The exposed surfaces of a fusion weld.
- (In stone masonry) The front surface of a wall.
- Stones**—In stone masonry, the stones forming the front of the wall.
- Faced Surfaces**—Having surface formed by placing a special aggregate not less than 1 inch next to the forms and contiguous with the body concrete.
- Facies**—Variety; especially applied to an igneous rock that in some respects is a departure from the normal or typical rock of the mass to which it belongs.
- Factor, Dynamic**—(See dynamic factor.)
- Load**—(See load factor.)
- Of Safety**—The ratio of the ultimate strength of a material to its working stress.
- (stress analysis) (aeronautic)—The ratio of the ultimate load to any applied load. This term usually refers to the probable minimum factor of safety, which is the ratio of the ultimate load to the probable maximum applied load.
- (Wire Rope)—The number of times stronger a wire rope is than the load it is expected to handle.
- Failure, Elastic**—(See elastic failure.)
- Fairing**—An auxiliary member or structure whose primary function is to reduce the drag of the part to which it is fitted.
- Wire**—A wire provided as a point of attachment for the outer cover to maintain the contour lines of the envelope of an airship.
- Fairway**—That reach of bay or harbor through which shipping passes to and from the sea, and as a general rule buoyed on each hand or having other aids in guiding ships.
- Fall Block**—The lower block of a hoisting tackle, to which the load is attached.
- Rope**—A wire or hemp rope reeved between two blocks to form a tackle for hoisting loads.
- Rope Carrier**—A device for supporting against sagging the operating ropes of a cableway.
- False Set**—(grab set) A cement which rapidly develops a crust sufficient to indicate an initial set, but which is not hardened in the interior and on reworking may set normally.
- Summit**—Where a street is level or has little headfall, a point in the gutter between two catch-basins artificially raised to facilitate drainage.
- Work**—Temporary support for a structure during construction.
- Farm Duty**—Irrigation water delivered to a farm unit.
- Fascia**—In architecture, a vertical

surface having a slight projection, as the lower members of the Ionic architrave.\*

—The outside decorative surface of a coping or a curb beam, which supports the railing.

**Fascine**—A round bundle of brush from one to three feet in diameter and ten to twenty feet long.

**Fat**—Containing an excess. A fat asphalt mixture is one in which the asphalt cement is in excess and the excess is clearly apparent.

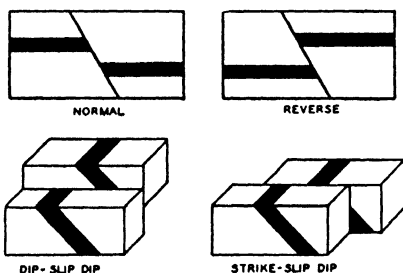
**Fat Coal**—Coals containing much volatile oily matter.

—**Spot**—A small area in a bituminous surface having an excess of bitumen. (See fat.)

**Fatigue of Metals**—The doctrine which states that repetitions or reversals of stress, when excessive, cause a deterioration of the metal. Strictly speaking, it does not apply at all to structural steel work.

—**Strength**—(See endurance limit.)

**Fault**—An abrupt break in the continuity of the beds or strata with the elevation or depression of beds on one side of the plane of the fault.



*Diagram illustrating four different types of faults*

—**Space**—The space between the walls of an open fault.

**Faulting**—In geology, the movement which produces relative displacement, along a fracture, of adjacent rock masses.

**Fauna**—The animals collectively of any given age or region. The plants are similarly called flora.

**Feather**—In rotary wing systems, to periodically increase and decrease the incidence of a blade or wing by oscillating the blade or wing about its span axis.

**Fees** (architects' and engineers')—The allowances made for the professional services required in the design, preparation of drawings and specifications, and supervision of architectural and engineering work.

**Feldspar**—Constitutes one of the most important group of rock-forming minerals. It is estimated that about 60 per cent of the earth's crust is composed of this mineral group.



*Photo courtesy Consolidated Feldspar Corp.  
Feldspar mine*

**Feldspathization**—Metamorphic alteration of other material into feldspar.

**Felloe Guard**—(See guard.)

**Felsitic**—(rock) Is an adjective applied to textures that are too fine to be determined with the naked eye.

**Femic**—A term used in the Quantitative System, from the first letters of ferrum and magnesium as used in ferromagnesian. Femic means rich in ferromagnesian minerals, as for example the basic rocks.

**Ferric Circuit**—An electric or magnetic circuit composed of iron.

—**Furnace**—A high, iron blast furnace, in the upper part of which crude bituminous coal is converted into coke.

**Ferrite**—A term used to describe microscopic crystals of iron oxide.

**Ferro-magnesian Minerals**—Minerals such as hornblende, augite, biotite, and olivine, which contain iron and magnesium.

**Ferruginous**—Containing iron.

—**Sandstone**—A sandstone in which the cementing medium is oxide of iron of primary origin, at least in part. The iron cement may be either limonite or hematite.

**Ferrule**—A metal ring or cap on the end of a cane, handle of a tool, post, or the like, to strengthen or protect it.

**Ferrum**—Iron, for which the chemical symbol is Fe.

**Ferry Rope**—A wire rope horizontally suspended across a stream for guiding or propelling a ferry boat.

**Fertilization**—The process of adding plant food to the soil, for purpose of plant growth.

**Fiber**—The longitudinal filament of body.

—A general term applied to manila, jute, sisal, and other kindred threads.

—**Concrete**—(See gypsum fiber concrete.)

—**Extreme**—The fiber which is most remote from the neutral axis.

—**Saturation Point**—In wood, the condition in which the cell cavities are empty but the cell walls are fully saturated with water.

—**Stress**—The stress on an elementary fiber, strip, or element of a member.

**Fibrous Fracture**—A fracture that shows the broken ends of fibers.

**Field Coat**—A coat of paint put on steel or other material after or just prior to erection.

—**Moisture Equivalent**—In soil technology, the minimum moisture

content, expressed as a percentage of the weight of the oven-dried soil, at which a drop of water placed on a smoothed surface of the soil will not immediately be absorbed, but will instead spread out over the surface and give it a shiny appearance.

—**Notes**—In surveying, field notes are written records of field work, made at the time the work is done.

—**Overall Efficiency** (or wire-to-water efficiency)—Takes into account the losses in both the deep well turbine pump and motor and is the ratio of energy converted into useful work, or water horsepower to energy supplied to the motor, or motor horsepower.

—**Stone**—Loose rock commonly of assorted sizes and character found upon the surface of the ground. Such material is usually associated with nearby outcrops of rock.

**Fiery**—The character or quality of steel as exhibited by its fracture when the grains are very coarse and bright.



*Fieldstone*

**Fill**—Depth to which material is to be placed (filled) to bring the surface to a predetermined grade; whence, difference in elevation between a surface point and a point vertically above it at the proposed grade. (Also called "Embankment.")

**Filled Spandrel Arch**—(See arch, filled spandrel.)

- Filler**—A plate the sole function of which is to fill up space.
- Mineral dust of 200-mesh size and smaller used in manufacturing bituminous mixtures.
  - In railway use, pieces of wood, metal or other material placed between stock guard slats to space and stiffen them.
  - Relatively fine material used to fill the voids in aggregate.
  - (for brick pavement) The material, such as asphalt, pitch or cement grout, that is placed in the interstices between the brick in order to completely fill and seal these joints.
  - Metal**—In welding, material specially prepared for addition to the weld in some forms of the fusion welding processes.
  - Pin**—A ring placed on a pin between connecting members of a pin connected bridge to keep them in position.
  - Plate**—A plate used to fill open spaces under members or parts thereof.
  - Removal**—(See surface removal method.)
- Fillet**—A concave junction or molding of two surfaces.
- The rounding of a sharp corner.
  - The rounded corner of a groove in a roll used in shaping structural steel.
  - In architecture, a small flat faced molding usually employed as a separating member.\*
- Fill Planes**—Visible surfaces of demarcation between sections of concrete deposited one above the other at different times. Usually horizontal or approximately horizontal, although sometimes inclined to a considerable angle.
- Filter**—(photography) A glass or gelatin plate placed in front of, in or back of the lens, to modify on the film or plate the effect of light, of different colors, or of some particular color.
- Filter, Aero**—(See aero filter.)
- High Pass Wave**—(See high pass wave filter.)
  - Low Pass Wave**—(See low pass wave filter.)
  - Press**—A machine for removing a liquid from crushed ore (or pulp), usually by forcing the liquid under pressure through canvas or cloth, leaving the muddy ore mass behind.
  - Trickling**—(See trickling filter.)
- Filtered Sewage**—The effluent of a properly functioning sewage filter.
- Filtering Medium**—The material through which sewage applied to a filter must pass.
- Filtration**—A mechanical process for removing suspended matter or bacteria from water by passing through sand or other close-grained media.
- The process of removing suspended and colloidal matter from a liquid and the oxidation of its dissolved organic matter, by causing it to flow through a relatively fine porous medium.
- Stage**—(See stage filtration.)
- Filtros**—The trade name applied to an artificial porous stone made of carefully graded siliceous sand by moulding, pressing, firing, annealing, and grinding. It is used as a filtering medium and for diffusing air in the activated sludge process.
- Fin**—A thin projection on a surface of a casting caused by the imperfect contact of the two molding flasks each containing a part of the mold.
- (aeronautic)—A fixed or adjustable airfoil, attached to an aircraft approximately parallel to the plane of symmetry, to afford directional stability; for example, tail fin, skid fin, etc.
- Carrier**—(aeronautic) A frame to which the inboard edge of the fin of a nonrigid or semirigid airship is attached, so as to prevent the edge of the fin from sinking into the envelope.
- Final Set**—(See set.)

- Settling Basin**—A tank through which the effluent of a trickling filter, or other oxidizing device, passes for the purpose of removing the settleable solids before its discharge.
- Settling Tank**—Same as final settling basin, but deeper and less area.
- Vacuum**—In wood preservation, the vacuum applied as the final operation in the treating process; used to aid in the removal of surplus preservative injected and in drying the timber.
- Fine Grade**—Preparation of the road subgrade surface after the paving forms have been placed. Work is done just ahead of paving operations.
- Lime**—Fine particles resulting from forking or screening quicklime.
- Pointed, or "F.P."**—In stone masonry work, this refers to the dressing in which the point depression is about  $\frac{3}{8}$ -inch apart with surface variations not more than  $\frac{1}{8}$ -inch from the pitch line.
- Rack**—A relative term, but generally used when the clear space between bars is 1 in. or less.
- Screen**—One having openings of  $\frac{1}{2}$ -inch, or less, in the least dimension.
- (sewage)—A relative term, but generally used for a screen with openings  $\frac{1}{4}$  in. or less, in least dimension.
- (aggregates)—One having openings of  $\frac{1}{2}$  in. or less, in least dimension.
- Fine-Grained (rock)**—Refers to those rocks in which the minerals are about 1 mm. or less in diameter.
- Fineness Modulus**—In the case of aggregates for concrete, an empirical factor obtained by adding the total percentages of a sample of the aggregate retained on each of a specified series of sieves, and dividing the sum by 100. The sieves are: Nos. 100, 50, 30, 16, 8, 4,  $\frac{3}{8}$ -in.,  $\frac{3}{4}$ -in.,  $1\frac{1}{2}$ -in. For procedure see standard tests of the American Society for Testing Materials.
- Ratio**—The ratio of the length to the maximum diameter of a streamline body, as an airship hull.
- Fines**—In soil physics, the finer grained particles of a mass of soil, sand, or gravel; in hydraulic sluicing, the material that slowly settles to the bottom of a mass of water.
- Finger Gully**—Very small gullies; the fan-shaped extensions at the head of a gully system.
- Patch**—A special form of patch having "fingers" extending from the central portion to distribute the load more widely to the fabric of an envelope or gas cell.
- Fingers**—Inclined guides on barge on which a mattress is woven and down which it slides to water surface.
- Finish**—The condition of a surface after the final work upon it has been performed.
- Ground**—A finish made on an object by grinding.
- Rough**—The finish which is left by the original forms, molds, etc.
- Finisher**—A mechanical device designed to produce a uniform contour on the riding surface of a pavement.
- One who is skilled in hand finishing operations.
- Finishing Stakes**—Final stakes set for the completion of the work.
- Fink Truss**—Properly, a trussed beam.
- Fiord**—A narrow, deep, steep-walled inlet of the sea, formed by the submergence of a mountainous coast.
- Fire Brick**—A refractory brick of fire clay or of siliceous material used to line furnaces.
- Firebreak**—A natural or constructed barrier made before a fire occurs, designed to stop or check fires that

may occur, or to be used as a line from which to work.

**Fire Clay**—A clay comparatively free from iron and alkalies, not easily fusible, and hence used for fire bricks.

**Fireproof Construction**—A housing term applied to a type of construction designed to withstand a complete burnout of the contents for which the structure was intended without impairment of structural integrity.

**Firkin**—The fourth part of a barrel.

**Firn**—Swiss name for the granular, loose or consolidated snow of the high altitudes before it forms glacial ice.

**First Mortgage Bonds**—A bond secured by a first mortgage is referred to as a first mortgage bond.

**Firth**—A narrow arm of the sea.

**Fish Paper**—A tough paper coated with linseed oil, and used for insulating purposes.

—A metal or wooden sheet or plate splicing two pieces of lumber together. Called splice plate when used with steel.

—**Screen**—A device intended to prevent the entrance of fish into a conduit.

**Fishtail**—A colloquial term describing the motion made when the tail of an airplane is swung from side to side to reduce speed in approaching the ground for a landing.

**Fishway (Fish Ladder)**—An arrangement of drops and pools to render possible the migration of fish around dams or other obstructions in streams.

**Fish-belly**—The form taken by some girders or trusses where the bottom flange or chord is convex downward. To swell downward.

**Fish-plate**—A short piece lapping a joint, secured to the side of two members, to connect them end to end.

**Fishing Space**—The space between the head and base of a rail occupied by the joint bar.

**Fissile**—Capable of being split, as schist, slate, and shale.

**Fitting**—A generic term for any small part used in the structure of an airplane or airship. If without qualification, a metal part is usually understood. It may refer to other parts, such as fabric fittings.

**Fitting-Up**—Assembling the different members of a structure and connecting them with bolts preparatory to riveting.

**Fixed Carbon**—In the case of coal, coke, and bituminous materials, the solid residue other than ash, obtained by destructive distillation, determined by definite prescribed methods.

—The organic matter of the residual coke obtained upon burning hydrocarbon products in a covered vessel in the absence of free oxygen.

—**Charges**—In engineering economics, a term often used to denote only the interest charges on the funded debt of plant, but more often used to include all expenses that go on, whether a plant is in operation or not.

—**End**—The anchored end. An end of a girder or strut so firmly connected as to prevent all motion in the vicinity of the end.

—**Light**—A light which is constant in luminous intensity with respect to both time and direction.

—**Load**—Any determined static load.

—**Post**—A post having fixed ends.

—**Power Plant Weight for a Given Airplane Weight**—The weight of the power plant and its accessories, exclusive of fuel and oil and their tanks.

—**Property**—Property of immovable nature or incapable of a change in location without reconstruction, either in whole or in part; property which may not be used except in a fixed location.

—**Span**—A span that is not movable, in contradistinction to a draw span.

—**Weight** (airship)—The weight of the machinery and all equipment and parts that are fixed in position and nonconsumable. Liquids in the cooling systems of the engines are included.

**Flagstone**—Is a thin bedded sandstone, often with mica, which splits easily and uniformly along the bedding plane; so that it can be quarried in large slabs.

**Flange**—One of the principal longitudinal members of a girder which resist tension or compression, also sometimes called the upper and lower chords of a beam. A projecting edge, rim or rib on anything.

—A projecting edge or rim.

**Flanger**—A form of plow, sometimes placed under a special railway car, called a flanger car, or under a railway snow plow, for clearing ice and snow from the inside of the rails, to provide a clear passage for the wheel flanges. Flangers are also frequently attached to locomotives, either on or just behind the pilot.

**Flangeway**—The open way through a railroad track structure which provides a passageway for wheel flanges.

**Flap**—(aeronautic) A hinged or pivoted airfoil forming the rear portion of an airfoil, used to vary the effective camber.

—**Drip**—(See drip flap.)

—**Pressure**—(See pressure flap.)

**Flapping Angle**—The difference between the coning angle and the instantaneous angle of the span axis of a blade of a rotary wing system relative to the plane perpendicular to the axis of rotation.

**Flash Point**—The temperature at which a given substance, being heated, begins to evolve vapor in such quantity that on application of a small flame a momentary flash, due to the ignition of the vapor, occurs. It is determined by precise methods.

—**Set** (quick set)—A cement which sets very rapidly after the addition of water.

**Flashboard**—A temporary barrier, usually of wood, placed along the crest of spillway dams to impound increased volumes of water. They are usually constructed so that they will be carried away during floods and thus lower the water level in the reservoir.

**Flashed Brick**—Brick that have had their edges darkened by special treatment in firing.

**Flashing Light**—A light which is intermittent as viewed from a single direction.

**Flasks**—The upper and lower parts of a box which contain the mold into which molten metal is poured.



*Illustrating the use of reinforcing bars in flat slab construction*

**Flat Ring Armature**—In electricity, usually a ring armature having a core shaped like a short cylinder.

**Flat Slab**—A concrete slab having reinforcement bars extending in two or more directions without beams or girders to carry the load to supporting members.

—**Spin**—A spin in which the longitudinal axis is less than 45 deg. from the horizontal.

**Flat-head**—A rivet or bolt head that has been flattened.

**Flat-Plate Area, Equivalent**—(See area, equivalent flat-plate.)

**Flaxseed Coal**—A fine size of anthracite coal.

**Flemish Bond**—That disposition of bricks in a structure in which the headers and stretchers alternate in each course, the header being so placed that the outer end lies on the middle of a stretcher in the course below.

—**Brick**—A hard, yellow paving brick.

**Flexible Conduit**—A conduit whose cross-sectional shape can be distorted sufficiently to change its vertical or horizontal dimension more than 3 per cent before causing materially injurious cracks; including those made of corrugated pipe, thin steel or wrought iron pipe. (Iowa State College.)

**Flexibility**—Describing the ease with which a rope may be bent or its ability to withstand bending in operation.

—Describing the ease or degree of distortion.

**Flexure** (or single flexure)—The bending of a section caused by pure force couples unaccompanied by any shearing force.

**Flight Path**—The flight path of the center of gravity of an aircraft with reference to the earth, or with reference to a frame fixed relative to the air.

**Flight-Path Angle**—The angle between the flight path of the aircraft and the horizontal.

—(After J. L. Land, Alabama) A mixture of hard granular material varying in particle size from a No. 200 to 3 in. It resembles talus of the Northwest with the exception that it has been washed into drifts and mixed with sand, silt, clay and sometimes organic matter. It is found in creek and river valley lands of extremely hilly and mountainous sections of Alabama. That portion of soil binder passing a 10-mesh sieve has very nearly the

same qualities as top soil with a poor gradation. The material larger than the 10-mesh sieve frequently has a coating of clay. The nature of the material in general facilitates stabilization.

**Flint**—A sedimentary rock, dark gray to black in color, hard, dense, composed essentially of minutely crystalline silica with little chemically combined water. Flint is commonly found in chalk beds. Some geologists consider flint a mineral term and not a rock term.

—**Falt**—Flint-falt is a bituminous concrete made from a stable asphalt emulsion. To it is added Joplin flint or similar hard stone, which is graded in size to leave the lowest percentage of voids.

**Float**—In geology, the loose fragments of rock, the small particles, as distinguished from outcrop or bedrock.

—In paving, to finish by dragging a heavy straight tool across the surface.

—A flat board or metal piece which is moved over the surface of fresh concrete to smooth it, or work out the high spots.

—(aeronautic) A completely enclosed watertight structure attached to an aircraft to give it buoyancy and stability when in contact with water.

—**Gage**—A measuring device for determining the elevation of the surface of a liquid, the actuating element of which is a float resting upon the liquid surface.

—**Gaging**—Measuring the flow of water by floats.

—**Inboard Stabilizing**—A stabilizing float placed relatively close to the main float or hull.

—**Outboard (or Wing-Tip) Stabilizing**—A stabilizing float placed relatively far out from the main float or hull, usually at or very near the tip of the wing.

—**Single**—A single central float fitted under a seaplane and usually re-

- quiring two stabilizing floats to give adequate stability and complete the float system.
- Stabilizing** (or side)—A float used in addition to a single float or hull and intended to provide lateral stability while the seaplane or flying boat is at rest on the water.
  - System**—The complete system of permanent floats, used to give buoyancy and stability to a seaplane or a flying boat while it is at rest on the water, and to provide hydrodynamic lift while it is taking off.
- Floating Aileron Linkage Arrangement**—(See aileron linkage arrangements.)
- Flocculate**—To aggregate in small lumps; said of soils and sediments.
- Flocculation**—The coming together or coalescing into woolly flakes of minute particles in a liquid.
- Flood Current** (tides)—The current that sets inland or up stream.
- Floodlight, Landing-Area**—A device designed to illuminate the surface of a landing area.
- System, Landing-Area**—A complete installation of floodlighting equipment designed to illuminate a landing area.
- Flood-gate**—A gate placed in a channel to prevent the ingress of flood or tidal waters.
- Floor**—Portion of a structure on which traffic moves or which directly receives the live load.
- Ballasted**—A bridge floor under a railway track upon which ballast is placed with ties embedded therein.
  - Beam**—A transverse beam or girder placed at the panel points of a span to support the stringers which carry the floor.
  - Beam Concentration**—The load transferred from one line of stringers to a floor beam.
  - Break**—The break or crack which separates a block of stone from the quarry floor.
  - Buckle Plate**—In bridge work, a floor system that is composed of buckle plates for supporting pavement.
  - Corrugated Steel**—A floor system composed of corrugated steel. (See corrugated.)
  - Suspended**—A floor attached to suspension cables or to girders by hangers.
  - System**—The floor beams, stringers, and slab or other members which comprise the direct load-carrying portion of a bridge.
- Flooring Off**—Term used in stowing the bottom layer or tiers of cargo in the hold of a ship.
- Floridin**—Fuller's earth from Quincy and Jamieson, Florida, used in decolorizing petroleum products.
- Flotation**—A method of collecting suspended matter in a tank as a scum at the surface by the evolution of gas by chemicals, electrolysis, heat, or bacterial decomposition.
- Gear** (aeronautic)—(See emergency flotation gear.)
- Flour**—Finely ground rocks or minerals pulverized to an impalpable product.
- Flow**—(creep) The gradual continuous distortion of an object under continued load, usually at high temperatures.
- Movement of a fluid.
  - In hydraulics, rate of movement of water in a conduit in terms of volume per time; discharge. The English unit of flow is the cubic foot per second, sometimes shortened to cusec, or second-foot; the metric unit is the liter or cubic meter second.
  - Line**—The bottom of a stream bed or the lowest point of the inside diameter of a pipe or conduit.
  - The position of the water surface of a flowing stream for a normal or specified rate of discharge; flowage line.
  - Lines**—In geology, lines of structure in igneous rocks indicating a flowing movement of the material

immediately preceding final consolidation.

—**Measurement**—A gaging.

—**Structure**—(rock) The parallel arrangement of the minerals in granite or other igneous rock in the direction of its flowage during its intrusion.

**Flowage Line**—A contour or line around a reservoir, pond, lake, or along a stream, corresponding to some definite water level (maximum, mean, low, spillway crest, etc.)

**Flowed Head**—A rolling out of the metal on top of the head of a railroad rail toward the sides without showing any indication of a breaking down of the head structure.

**Flowing-Through Chamber**—The upper compartment of a 2-story sedimentation tank.

**Flowing Well**—(petroleum) An oil well in which pumping is not necessary to bring oil to the surface.

**Flume**—An open conduit of wood, concrete, or metal, on a prepared grade, trestle, or bridge. A flume holds water as a complete structure. A concrete-lined canal would still be a canal without the lining, but the lining supported independently would be a flume.

—**Improved Venturi**—(See Parshall measuring flume.)

—**Parshall Measuring**—(See Parshall measuring flume.)

**Flush** (adj.)—Having the surface even or level with an adjacent surface.

—(verb)—1. To fill. 2. To bring to a level. 3. To force water to the surface of mortar or concrete by compacting or ramming.

—**Coat**—(See bituminous seal coat.)

—**Production**—The yield of an oil well during the early period of production.

—**Tank**—A tank in which water or sewage is accumulated, to be quickly discharged later, for the purpose of flushing the sewer.

**Flusher**—A tank wagon or tank

truck provided with piping and spread spray nozzles for shooting a broad spray of water on streets.

**Flushing**—(1) Completely filling the voids. (2) Washing a pavement with an excess of water.

—**Manhole**—A manhole provided with a gate so that sewage or water may be accumulated and then discharged rapidly for flushing a sewer.

**Flute**—In architecture, the vertical channels on the shaft of a column.\*

**Flutter**—(aeronautic) An oscillation of definite period but unstable character set up in any part of an aircraft by a momentary disturbance, and maintained by a combination of the aerodynamic, inertial, and elastic characteristics of the member itself (cf. buffeting).

—**Echo**—In acoustics, a rapid succession of reflected pulses resulting from a single initial pulse. If the flutter echo is periodic and if the frequency is in the audible range, it is called a musical echo.

**Fluvial**—Of, or pertaining to, rivers; growing or living in streams or ponds; produced by river action, as a fluvial plain.

**Fluviation**—All the numerous activities of streams.

**Fluvio-Glacial**—Pertaining to streams which obtain their water and much of their load from melting glacial ice; also land forms produced by the action of such streams.

**Flux or Flux Oil**—(asphalt) A thick, viscous non-volatile oil recovered from petroleum by distilling off the light volatile products present in the crude petroleum. It is used to soften asphalts, which are too hard for use, to any desired consistency.

—(tar) A liquid thinning agent mainly used in the manufacture of tar road materials for reducing the viscosities of refined tars or pitches.

—To convert to a liquid state by means of heat; to melt.

—(welding) Material used to prevent the formation of oxides, nitrates, etc., in the weld and to eliminate those which have formed.

**Flux-Spoon**—A small ladle for dipping up a sample of molten metal for testing.

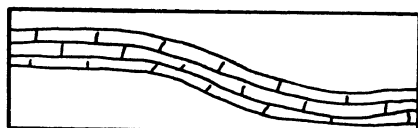
**Fly**—(1) To operate an aircraft in flight. (2) To ride as a passenger in an aircraft.

—**Ash**—A product of the combustion of pulverized coal.

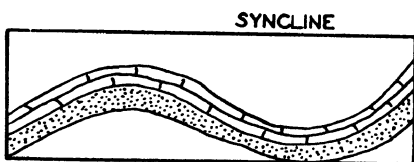
**Flying Boat**—A form of seaplane whose main body or hull provides flotation.

—**Levels**—In surveying, a line of levels to determine approximate elevations, run with more rapidity and less precision than usual.

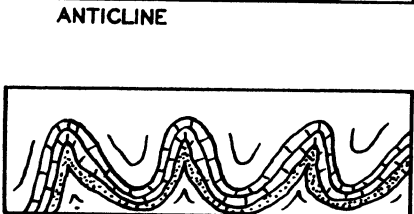
**Foaming**—The term applied to the action of a boiler when steam bubbles build up over the surface of the water to such extent that the steam space and dome are filled, and syphoning action is started which causes water to be carried over with the steam into the engine cylinders.



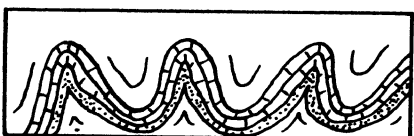
MONOCLINE



SYNCLINE



ANTICLINE



COMPLEX FOLDING

*Some examples of folding*

—The condition of hot asphalt cement caused by rain or water getting into the hot bitumen and causing excessive building up of small bubbles.

**Focal Length**—(photography) Distance along the lens axis between the real nodal point of a lens and the primary focal plane. In optics, the true focal length is measured from the principal point to the focal point.

**Focus**—(photography) Point where rays of light meet after passing through a lens. The rays from an infinitely distant object are incident on a lens as a bundle of parallel rays and converge and form an image in the "primary focal plane." The point at which the lens axis pierces the primary focal plane is the "primary focal point." In all lenses used in photographic mapping the primary focal plane and focal point are the posterior, or rear, focal plane and focal point; that is, the plane and point on the side of the lens away from the object. **Conjugate Foci**—Two points so related that rays from one are focused at the other.

**Fold**—(of rock) A bend in the rocks.

**Foliated** (rock) — Leaf-like. The meaning is similar to that of laminated, but the latter generally indicates a finer or more parallel division into layers, foliated being applied rather to the approximate parallelism of the layers in such rocks as gneiss and schist.

**Foliation**—The banding or lamination of metamorphic rocks as distinguished from the stratification of sediments.

**Follower**—A member interposed between a pile driver hammer and pile to transmit blows to the latter when below the foot of the leads.

**Fool's Gold**—Pyrite, a sulphide of iron.

**Foot-candle**—The unit of illumination, and is the illumination upon a surface which receives from all

- light-sources, directly or by reflection, one lumen per square foot.
- Lamberts**—(See brightness.)
- Pound**—The unit of work done by a 1 lb. force when its point of application moves one foot in the direction of the force.
- Ton**—A unit of work equal to that involved in overcoming one ton of resistance through the space of one foot, or in raising one ton one foot high.
- Footing**—(arch) The abutment wall or pier which transmits the load from an arch to the foundation material.
- (architectural) The construction upon which the superstructure or abutment wall rests.
- (architectural) — The spreading course at the base of a foundation.
- A structural unit used to distribute wall or column loads to the foundation materials.
- Column**—A footing, or spread base, under a vertical thrust member.
- Courses**—In stone masonry work, the bottom or foundation courses, which usually project beyond the "neat work" of an abutment.
- Pedestal**—(See pedestal footing.)
- Spread**—(See spread footing.)
- Footway**—The portion of the highway devoted especially to pedestrians. A sidewalk.
- Force**—That which changes the state of rest or motion in matter, measured by the rate of change of momentum.
- Axial**—(See axial force.)
- Centrifugal**—The reaction of a body due to its inertia, against that force which is causing it to deviate from a straight-line motion and to travel in a curved path.
- Centripetal**—A force pulling a body toward the center of rotation.
- (See centripetal force.)
- Couple**—A pair of opposed forces acting about a central axis. (See couple.)
- Forced Vibration**—In acoustics, any vibration that is imposed upon a system by external force and whose frequency is controlled thereby.
- Forces, Triangle or Polygon of**—(See triangle or polygon of forces.)
- Ford**—A shallow place where a stream may be crossed by traffic.
- Dry Weather**—A stream crossing provided with culverts which carry the normal or low water flow, but which in time of floods are inadequate to carry the water, causing or allowing the water to flow over the road. The surface and shoulders are generally protected against erosion. A paved channel crossing.
- Forebay**—A reservoir or pond at the head of a penstock or pipe line.
- Foreshore**—That portion of bank or shore lying adjacent to and sloping gradually to the water.
- Foreshore**—(See diagram near definition of beach.)
- Foresight**—1. (transit traverse) A point set ahead on line to be used for reference when resetting the transit on line or when verifying the alinement. 2. An observation of the distance and direction to the next instrument station. 3. (leveling) The reading on a rod that is held at a point whose elevation is to be determined. (A Foresight is often called a Minus Sight because it is subtracted from the height of instrument to obtain the elevation of the point. It is not, however, essentially a negative quantity. When the rod is held inverted, as in taking levels on overhead shafting, the reading is of opposite sign to that read in the usual position because it is measured in the opposite direction from that normally used. The term Minus Sight is recommended as preferable; but the older term, Foresight, is still in general use.)

- Forestation**—The establishment of forest naturally or artificially upon areas where forest is absent or insufficient.
- Forest Marble**—An argillaceous limestone which when cut along certain planes shows the dark coloring matter so distributed as to be imitative of woodlands and forests; also called landscape marble.
- Forge**—To work wrought iron into shape by first softening by heat and then hammering into required form.
- Pig**—An inferior grade of iron used for puddling and for some classes of foundry work.
- Shop**—A place where forgings are made.
- Forging**—The process of welding metal or that of bringing it to shape when hot by hammering.
- Drop**—A forging produced by a machine controlling a descending weight or striking pressure.
- Forked Drill**—A slotted tool with a Y-point used in a slot drilling machine.
- Form**—A temporary structure or mold in which to cast concrete.
- Formalin**—An aqueous solution containing approximately 40 per cent of formaldehyde—use as a disinfectant.
- Formal Type**—A roadside development term referring to the planting and arrangement of trees and other landscape items at even distances in straight rows along city approaches or within the city proper.
- Formation**—As defined and used by the U. S. Geological Survey, the ordinary unit of geologic mapping consisting of a large and persistent stratum of some kind of rock.
- Former**—A device for giving a particular shape to an article.
- (Or False) Wing Rib**—An incomplete rib, frequently consisting only of a strip of wood extending from the leading edge to the front spar, which is used to assist in maintaining the form of the wing where the curvature of the airfoil section is sharpest.
- Forming Iron**—A blacksmith's swage block.
- Formula**—Any general equation; a rule or principle expressed in algebraic symbols.
- A symbolic statement of compounded chemicals.
- A method of reasoning stated in the form of an equation.
- Rational**—A formula derived from fundamental principles.
- Weight, Gram**—(See gram-formula weight.)
- Fossil**—Originally any rock, mineral, or other object dug out of the earth. Now, any remains, impressions, or trace of an animal or plant of past geological ages which have been preserved in a stratified deposit or in a cave.
- Index**—(See index fossil.)
- Fossiliferous**—Containing organic remains.
- Foul-Ballast**—Ballast which has lost its porosity through the filling up of the voids by cinders, coal dust, disintegration of the ballast itself, dirt, or other foreign matter.
- Foundation**—The natural material which supports a structure, and its loads, whether strengthened or not by the use of piles, mats, or other means to secure adequate bearing.
- The portion of the roadway below and supporting the crust or pavement. **Artificial foundation**—That layer of the foundation especially placed on the subgrade for the purpose of reinforcing the supporting power of the latter itself, and composed of material different from that of the subgrade proper.
- That portion of a structure, usually below the surface of the ground, which distributes the pressure upon its support.
- Bed**—The surface on which a structure rests.
- Mattress**—A slab of concrete, usu-

- ally reinforced, placed over a yielding foundation to distribute the superimposed load.
- Natural Soil**—(See natural soil foundation.)
- Pit**—(architectural) An excavation made for laying the footing of a structure.
- Foundry**—An establishment or plant where metals are cast.
- Iron**—An iron used in foundry work.
- Pig**—Pig iron used in foundry castings.
- Fourchite**—A name for those basic dike rocks that consist essentially of augite in a glassy ground mass.
- F. P.**—(See fine pointed.)
- Fractional Appraisal**—An appraisal of a portion only of a property; specifically the term is intended to apply under conditions which may or may not be incompatible with those applicable to the entire property, and where the relationship of such portion to the whole, being unknown or separately included or omitted necessitates proper qualifications in the report as to fractional part.
- Fractorite**—An explosive mixture containing 90 per cent ammonium nitrate, 4 per cent resin, 4 per cent dextrin, and 2 per cent potassium dichromate.
- Fracture**—(of rocks) Cracks in rocks large enough to be distinctly visible to the naked eye, without regard to definite direction.
- Rupture of a material by a break through its entire thickness.
- Columnar**—A cleavage into columns shown in the surfaces of the fracture.
- Crystalline**—(See crystalline fracture.)
- Cup**—A fracture in the shape of a cup.
- Fibrous**—(See fibrous fracture.)
- Granular**—(See granular fracture.)
- Frame Diagram**—A diagram of a frame in which the positions of the axes of the joints are shown by points, while the rigid connections are shown by lines between them.
- Field Handling**—A portable frame which may be attached to an airship when it is on the ground and which is intended to provide a hold for more men than could grasp the handling rails of the cars.
- Framed Dam**—In soil conservation, a barrier generally built of timber framed to form a water face, supported by struts.
- Trestle**—A structure in which the upright members or supports are framed timbers.
- Framing Stern**—All framework, aft of the cruciform girder, necessary to complete the shape and contour of a rigid airship.
- Frap**—To bind together with a rope.
- Frazil Ice**—Granular or spicular ice which forms in agitated water. Riffles and rapids are prolific sources of such ice during protracted freezing temperatures. Named from a French word meaning "cinders," from its resemblance to a clot of floating cinders.
- Free Air**—Air at normal atmospheric conditions. Because the altitude, barometer and temperature vary at different localities, it follows that this term does not mean air under identical conditions.
- Balloon**—A balloon, usually spherical, whose ascent and descent may be controlled by releasing ballast or gas and whose direction of flight is determined by the wind.
- Carbon**—(in tars) Organic matter which is insoluble in carbon disulfide. This term is frequently but improperly used.
- Chlorine**—Chlorine in solution in uncombined form.
- Flow**—An hydraulic term referring to a condition of flow through or over a structure not affected by submergence or backwater.
- Gold**—Gold uncombined with other substances; placer gold.
- Haul**—The distance within which

- grading material is moved without extra compensation.
- Lime**—In cement technology, calcium oxide which remains uncombined in the clinker, due either to excess lime in the mixture or to under burning. Occasionally the term is used to apply to calcium hydroxide formed when water is added to Portland cement, but this use should be discouraged.
  - Outlet** (as it pertains to critical flow)—Exists when the back water does not diminish the discharge of a conduit.
  - Path, Mean**—(See mean free path.)
  - Running Engine**—A term applied to a railway motor car engine connected to the drive axle of the railway motor car in such a manner that the engine may be started and run without moving the car, the power being transmitted to the axle by means of a clutch, friction disc or belt.
  - Vibration**—In acoustics, any vibration which exists in a system after all driving forces have been removed from the system.
  - Water**—Water in soil in excess of hydropscopic and capillary water; also called gravity water.
  - Wave**—In acoustics, a sound wave free from interference effects.
  - Weir**—A weir that is not submerged, the downstream water surface being lower than the weir crest.
  - Free-Balloon Net**—A rigging made of ropes and twine shaped to fit the upper surface of the envelope, which supports the weight of the basket, etc., and distributes the load over the entire upper surface of the envelope.
  - Freeboard**—In hydraulics, the vertical distance between the maximum water surface elevation anticipated in design and the top of retaining banks or structures; e. g., sides of an open channel, crest of a dam, etc.
  - Freestone**—Any stone, especially a sandstone, that may be cut freely in any direction without a tendency to split.
  - Freeway**—A highway term referring to a roadway in which traveled surface is devoted to the exclusive use of motor vehicles; direct access to and from abutting properties is eliminated; access is restricted to properly located and designed entrances and exits at infrequent intervals; all intersections are separated or eliminated so that no traffic crosses at grade; and opposing streams of traffic are separated physically.
  - French Drain**—An underground passageway for water through the interstices among stones placed loosely in a trench.
  - Frequency**—In acoustics, the number of cycles occurring per unit of time, or which would occur per unit if all subsequent cycles were identical with the cycle under consideration. The frequency is the reciprocal of the period. The unit is the cycle per second.
  - Basic**—(See basic frequency.)
  - Curve**—A graphical representation of the time distribution of an orderly arrangement of magnitudes, such as run-off, precipitation, etc.; a duration curve.
  - Fundamental**—(See fundamental frequency.)
  - Resonant**—(See resonant frequency.)
  - Fresco**—In architecture, fresco painting. Correctly speaking, this term means painting on fresh, wet plaster.\*
  - Fresh Sewage**—Sewage which at the point of examination contains some dissolved oxygen.
  - Fret**—In architecture, an ornamental, decorative pattern intersecting at right angles.\*
  - Friction Head or Loss**—(hydraulics) The head or energy lost as the result of the disturbance set up by the contact between a moving

- stream of water and its containing conduit.
- Slope**—(hydraulics) The friction head or loss per unit length of conduit. Friction slope is equal to the bed or surface slope only for uniform flow.
- Tape**—Cotton tape impregnated with a sticky substance, and used for an insulating medium.
- Frieze**—In architecture, the second division of entablature.\*
- Frise Aileron**—An aileron having the nose portion projecting ahead of the hinge axis, the lower surface being in line with the lower surface of the wing. When the trailing edge of the aileron is raised, the nose portion protrudes below the lower surface of the wing, increasing the drag.
- Frog**—A track structure used at the intersection of two running rails to provide support for wheels and passageways for their flanges, thus permitting wheels on either rail to cross the other.
- Angle**—In railway use, the angle formed by the intersecting gage lines of a frog.
- Cross**—(See cross frog.)
- Number**—In railway use, one-half the cotangent of one-half the frog angle, or the number of units of center line length in which the spread is one unit.
- Front of Levee**—Side next to river.
- Frontal Aprons**—In glacial geology, the deposits of sand and gravel spread out in front of the ice sheet.
- Frost Batter**—In stone masonry, a batter occasionally given to the rear of a wall near its top to prevent the dislocation of the top course of stones upon the formation of frost in the ground.
- Box**—A box surrounding a water meter or waterpipe and containing some heat insulator, like mineral wool, excelsior, or sawdust, to prevent the water from freezing.
- Pin**—A short heavy iron pin used by surveyors to make a hole in frozen ground so that a wooden peg may be driven without breaking.
- Scaling**—(of concrete) Somewhat resembles the manipulation scaling except that it is more irregular in thickness. This type of scale results from a freezing of the surface before the concrete has thoroughly hardened, but subsequent to final set.
- Fuel Bypass Regulator** (aeronautic)  
—(See regulator, fuel bypass.)
- Dope** (aeronautic)—Any material added to the fuel in small quantities for the purpose of preventing detonation.
- Oil**—Any liquid or liquefiable petroleum product used for the generation of heat in a furnace or firebox, the controlling factors being cost and adaptability. Fuel oils in common use fall into one of four classes: (a) Residual fuel oils, which are topped crude petroleum products or viscous residuums obtained in refinery operations; (b) distillate fuel oils which are distillates derived directly or indirectly from crude petroleum; (c) crude petroleum products and weathered crude petroleum products of relatively low commercial value; (d) blended fuels, which are mixtures of two or more of the three classes.
- Ratio**—The amount of heating capacity in a fuel as compared with another fuel taken as a standard.
- Fuel-Tank Vent**—A small tube used to conduct surplus fuel from a fuel tank, overboard clear of the airplane, and to equalize pressures.
- Fulgurite**—Little tubes of glassy rock that have been fused from all sorts of other rocks by lightning strokes. They are especially frequent in exposed crags on mountain tops.
- Full Cell Treatment**—In wood preservation, a treatment in which the cells in the treated portion of

- the wood remain either partially or completely filled with preservative.
- Load**—Weight empty plus useful load; also called gross weight.
- Full-centered**—In stone masonry work, an arch that is a full semi-circle, or half-circle.
- Fuller**—A blacksmith's tool with a round edge, used in grooving or spreading hot iron; a swage or creaser.
- Fuller's Earth**—A fine earth resembling clay, but lacking plasticity. It is much the same chemically as clay, but has a decidedly higher percentage of water. It is high in magnesia and possesses the property of decolorizing oils and fats by retaining the coloring matter. (See Floridin.)
- Fumarole**—A hole or spot in a volcanic or other region, from which fumes issue.
- Fumigant**—A substance released in closed spaces in gaseous form for destruction of germs or insects.
- Function**—A mathematical quantity which has a value depending upon the values of other quantities that are called the arguments, or independent variables, of the function.
- Carnot's**—(See Carnot's function.)
- Functional Obsolescence**—A term used in economics of highway planning which may apply to the condition wherein the highway unit has become outgrown by its own traffic.
- Functions, Trigonometric**—Certain relationships of the sides of a right angle triangle expressed as properties of an angle or arc used in trigonometric work, such as sine, cosine, tangent, or their several reciprocals.
- Fundamental Frequency**—In acoustics, a fundamental frequency is the lowest component frequency of a periodic wave or quantity.
- Funded Debt**—A company's bonds, debentures and notes are called its funded debt, the holders being the company's creditors.
- Fungus**—A low form of plant life without root, stem or leaves. Fungi contain no chlorophyll and derive nourishment from organic matter.
- Furnace, Balling**—(See balling furnace.)
- Basic Open-hearth**—A highly heated enclosed container used in the manufacture of basic open-hearth steel. (See open-hearth process.)
- Bessemer**—A furnace mounted on trunnions so as to be tilted in either direction and having air-blast connections through the trunnions, used for converting pig iron into Bessemer steel by a process of decarburization.
- Cermak-Spirek**—(See Cermak-Spirek furnace.)
- Chenhall**—(See Chenhall furnace.)
- Ferric**—(See ferric furnace.)
- Puddling**—A reverberatory furnace in which cast iron is converted into wrought iron.
- Regenerative**—(See regenerative furnace.)
- Reverberatory**—A furnace having a vaulted ceiling which deflects the flames and heat downward toward the hearth where the ore is to be fused, the fuel being separated from the ore by a compartment.
- Rotary**—A form of puddling furnace in which the hearth is made to rotate in a vertical or a horizontal plane in order to assist in removing the carbon.
- Furring Brick**—Hollow brick for lining or furring the inside of a wall. Usually of common brick size, with surface grooved to take plaster.
- Furrow Irrigation**—A method of irrigation by small ditches or furrows leading from a header or supply ditch.
- Furrowed**—Plowed in parallel lines.
- In river and harbors work, the loosening of surface of natural soil of foundation of levee to minimize seepage or tendency of levee

to slide on its base where built on a slope or where an enlargement is made to an existing levee.

**Fuse, Blasting**—(See blasting fuse.)

—**Block**—In electricity, a block for supporting safety fuses in an electric circuit.

—**Branch**—(See branch fuse.)

—**Cartridge**—(See cartridge fuse.)

—**Gage**—An instrument for cutting time fuses to length.

—**Open**—(See open fuse.)

—**Powder**—(See powder, fuse.)

—**Safety**—(See Bickford's safety fuse.)

**Fuselage**—The body, of approximately streamline form, to which the wings and tail unit of an airplane are attached.

**Fusible**—Capable of being melted or liquefied.

**Fusibility Scale**—A list of minerals arranged in the order of their fusibility, as follows: (1) stibnite, (2) natrolite, (3) almandite garnet, (4) actinolite, (5) arthoclase, (6) bronzite.

**Gabbro**—(rock) A basic plutonic rock, of holocrystalline structure, consisting essentially of plagioclase feldspar and a pyroxene, with olivine sometimes occurring.

**Gabbro-diorite**—Gabbro rocks with hornblende which may be secondary after augite. Intermediate rocks between true gabbros and diorites.

**Gad**—A steel wedge; a small iron punch with a wooden handle, used to break up ore; a metal spike.

**Gag Process**—The method of bending structural shapes in a gag press.

—In hydraulics, a staff graduated to indicate the elevation of a water surface; a device for registering water levels, flow, velocity, pressure, etc.

—A device for making measurements.

**Gage**—(of track) The distance between the gage lines, measured at right angles thereto. (The standard gage is 4 feet 8½ inches.)

—(track tool) A device by which the gage of a track is established or measured.

—(Or gauge) A standard measurement of the thickness of metal sheets or wire and bearing a relation to the weight of the metal.

—**Fuse**—(See fuse gage.)

—**Gas**—(See gas gage.)

—**Height**—In hydraulics, the elevation of a water surface above or below a datum corresponding to the zero of the staff or other type of gage by which the height is indicated.

—**Line**—In railway use, a line ⅝ inch below the top of the center line of head of running rail or corresponding location of tread portion of other track structures

along that side which is nearer the center of the track.

—In road building, the string line to which a formgrader works.

**Gages, Recording**—Automatic instruments for measuring and recording graphically the time, temperature, pressure and vacuum used in a timber treating or other industrial operation.

**Gagger**—A piece of iron used in a mold to keep the sand or core in place.

**Gagging**—The work done on a rail at the straightening press with a steel "gag" or tool for the purpose of taking out a bend.

**Gaging**—A single measurement of flow corresponding to a certain stage.

—**Station**—In hydraulics, a selected point along a stream channel at which is installed a gage and other facilities for determining the elevation of the water surface either periodically or continuously, and for measuring the flow of water.

**Galena**—Lead sulphide, PbS. Contains 86.6 per cent lead.

**Gall of Glass**—A neutral salt skimmed off the surface of melted crown glass. Also called sandiver.

**Gallery**—A subsurface collector for percolating water; a passageway, as in a dam; an underground conduit or reservoir; a room or passageway in a water treatment or sewage disposal plant where the piping and valves are arranged.

—In mining, a level or drift.

**Gallon (U.S.)**—The standard gallon of the United States contains 231 cubic inches, or 8.3389 pounds avoirdupois of distilled water at its maximum density and with a barometer of 30 inches. Where a measured gallon is called for, the temperature at which it is to be

measured should be specified. Where a gallon of definite weight is called for, the weight should be specified or obtained from the specific gravity of the material at a definite temperature.

**Galvanized Rope**—A rope made up from wires coated with zinc as protection against rust or corrosion.

**Gamma Dicalcium Silicate**—In cement technology, a modification of dicalcium silicate that may form in clinkers of certain compositions or following certain heat treatments, which is responsible for dusting of clinker. Has little hydraulic value; commonly abbreviated to gamma  $2\text{CaO} \cdot \text{SiO}_2$  or gamma  $\text{C}_2\text{S}$ .

**Gang Drill**—A machine tool containing in one head a number of vertical drills, each having its separate belt and pulley operated from a common shaft.

**Gang, Erection**—A gang of men that do the work of assembling the skeleton parts of a structure.

**Ganggesteine**—German word for dike rocks.

**Gangue**—The non-metalliferous or non-valuable metalliferous minerals in the ore.

**Ganister**—A compact, highly refractory and siliceous sedimentary rock, with a fine and even granular texture; composed of medium to fine grains of angular quartz cemented with silica. Used for furnace linings.

**Gantry**—A frame or scaffold which supports a crane or other structure.

**Gap**—The distance separating two adjacent wings of a multiplane.

**Garnet**—Complex silicate containing iron, calcium, magnesia, alumina, manganese, etc. Some varieties of garnet are: spessartite, almandite, pyrope, grossularite, and uvarovite.

**Gas**—To replenish a balloon with fresh gas, in order to increase the

purity, or to make up for a loss of gas.

—**Coke**—The coke formed in gas retorts, as distinguished from that made in coke ovens.

—**Combination**—(See combination gas.)

—**Dry**—(See dry gas.)

—**Gage**—An instrument for ascertaining the pressure of gas, generally consisting of a bent graduated tube containing water or mercury, open at one end with the other end screwed into the vessel containing the gas.

**Gas Oil**—A liquid petroleum distillate having a viscosity intermediate between that of kerosene and lubricating oil.

—One of the first products of distillation in the manufacture of lubricating oils.

—**Pocket**—In welding, a cavity in a weld caused by the trapping of gases liberated by the metal when cooling.

—**Spectrum**—The spectrum, consisting of bright lines or bands, obtained by dispersing the light from a glowing gas or vapor.

—**Vent**—(1) A passage to permit the escape of gases of decomposition. (2) An opening which allows gas, liberated in an Imhoff tank sludge digestion chamber, to reach the atmosphere without passing up through the sewage in the settling chamber.

**Gas-Cell Fabric** (aeronautic)—(See fabric, gas-cell.)

—**Net** (rigid airship)—A small-mesh netting of cord, intended to assist the fabric of the gas cells in transmitting the gas force to a wire netting of coarser mesh and to the longitudinals, both being fitted between the longitudinals. It may be compared to the net of a free balloon. Sometimes called "gas-cell netting" or "cord netting."

**Gas-house Coal Tar**—Coal tar produced in gas-house retorts in the

manufacture of illuminating gas from bituminous coal.

**Gas-Shaft Hood**—A hood, or cowl, located on the outer cover of a rigid airship at the outer end of a gas shaft.

**Gasket**—A thin sheet of rubber, cloth, paper, sheet metal or other material forming a joint between two pieces of metal to prevent leakage.

—**Rope-yarn** or hemp used for stuffing at the joints of pipes.

**Gasoline**—A refined petroleum naphtha which by its composition is suitable for use as a carburant in internal combustion engines.

**Gassing Factor**—The quantity of aerostatic gas required to maintain an aerostat for one year. It is ordinarily expressed as a percentage of the gas volume.

**Gate**—A movable barrier consisting of a structure of wood, metal or other material, for closing a passageway or an opening in a fence.

—**Brace**—A piece of wood, metal or other material, in compression, placed diagonally and used to stiffen the frame of a gate.

—**Drainage**—A valve or cover over the end of a drainage conduit for controlling the flow.

—**Frame**—The sustaining part of a gate, fitted and framed together, to which the other members are attached.

—**Tie**—A piece of wood, metal or other material, in tension, placed diagonally and used to stiffen the frame of a gate.

—**Valve**—A pipe fitting for controlling the flow of fluid so constructed that the barrier is raised or lowered at right angles to the flow of the liquid.

**Gauss**—A unit of magnetic flux density, equal to one line of magnetic force per square centimeter.

—**Point**—(See Principal Point.)

**Gavel**—A mason's setting-maul.

**Gay-Lussac's Law of Combining Volumes**—If gases interact and

form a gaseous product, the volumes of the reacting gases and the volumes of the gaseous products are to each other in very simple proportions, which can be expressed by small whole numbers.

**Geanticline**—A great upward flexure of the earth's crust.

**Gear, Bevel**—(See bevel gear.)

**Gearied Propeller**—A propeller driven through gearing, generally at some speed other than the engine speed.

**Geat**—The hole in a mould through which the metal is poured in casting.

**Ge!**—A form of matter in a colloidal state that does not dissolve, but nevertheless remains suspended in a solvent from which it fails to precipitate without the intervention of heat or of an electrolyte.

**General Mortgage Bonds**—These bonds are secured by a mortgage upon the property of a corporation which is already encumbered as security for older bond issues.

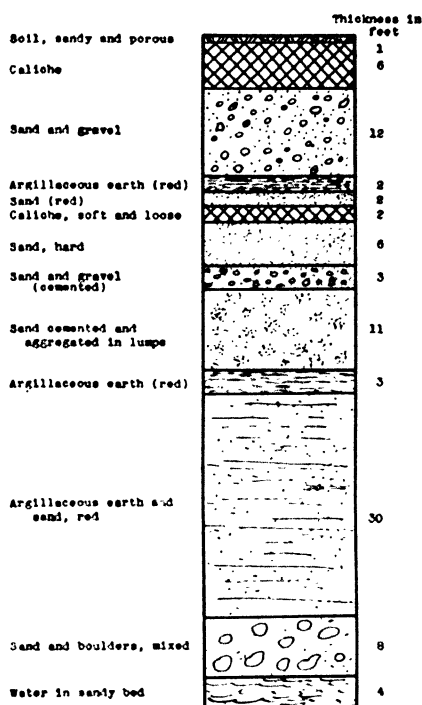
**Geode**—A hollow nodule or concretion, the cavity of which is lined with crystals.

**Geodesy**—The science and art of measuring portions of the earth's surface by triangulation and astronomical observation.

**Geologic Column**—Is a diagram showing the sequence and original stratigraphic relations of the various formations in a region.

—**Norm**—The condition which resulted from the balance between soil and vegetation, established by nature, following the ages of geologic and glacial disturbance.

**Geological Thermometer**—A term applied to known temperature limits within which certain minerals or mineral aggregates must have formed; based on the thermal data relating to the fusion-points of rocks and minerals, and the inversion or transition points of allotropic modifications of rock-forming compounds, and in general to the equilibrium conditions and sta-



*Geologic column showing beds of caliche*

bility ranges under different conditions of pressure for various minerals.

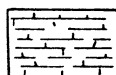
**Geology**—The science which treats of the history of the earth and its life, especially as recorded in the rocks. Three chief branches or phases are usually recognized: (1) structural geology, treating of the form, structure, and arrangement of rocks; (2) dynamic geology, dealing with the causes and processes of geological change; and (3) historical geology, dealing with the chronological order and events of the earth's history.

**Geometrical Pitch of a Propeller (aeronautic)**—(See pitch of a propeller, geometrical.)

**Geomorphic**—Of or pertaining to the figure of the earth or the form of its surface; resembling the earth.

**Geophysical**—Relating to properties of energy and matter within the earth.

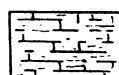
**Geosyncline**—A great downward flexure of the earth's crust.



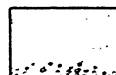
Limestone



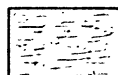
Shales



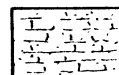
Shaly Limestone



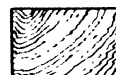
Sandstone and Conglomerates



Shaly Sandstone



Calcareous Sandstones



Schists



Massive and bedded igneous rocks

*Conventional symbols for kinds of rocks (after Eckle)*

**Germicide**—A gas, liquid, or powder, having power to destroy germs.

**Get-Away Speed**—The air speed at which a seaplane becomes entirely air-borne.

**Geyser**—A spring from which hot water and steam, and, in some cases, mud, are intermittently thrown vertically like a fountain, to a considerable height. The geyser 10 miles out of Green River, Utah, U.S.A., is a cold water spouting caused by gas formation.

**Geyserite**—A general term for the siliceous deposits, usually opaline, formed around thermal springs and geysers, whether loose, compact, or concretionary.

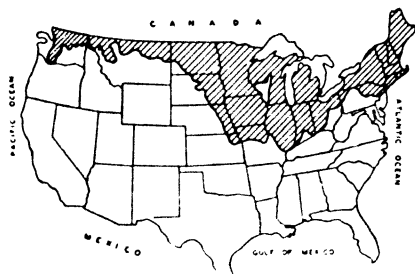
**Giant**—A nozzle, mechanically or hand-controlled, for directing a jet of water for hydraulicking.

**Gib**—A piece of metal in the shape of an elongated channel, used as a clamp.

**Gilsonite**—A hard, brittle, native asphalt occurring in various localities in rock crevices or veins from which it is mined like coal.

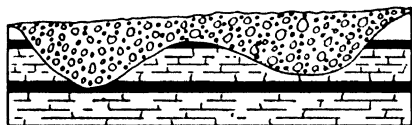
- Gin Pole**—A pole, guyed upright, from which a set of tackle blocks is hung, for hoisting loads.
- Girder**—A beam or compound structure acting as a beam carrying principally transverse loads which develop normal reactions at the supports.
- Arched**—(See arched girder.)
  - Bowstring**—A girder consisting of a curved rib or beam, having a horizontal tension member arranged as a chord and connected to the rib by vertical tie rods.
  - Box**—A type of girder having two webs giving a section resembling a box made up of plates and angles riveted together and forming flanges and webs.
  - Bridge**—A bridge with a superstructure composed of a floor system supported on two or more **deck** or **through** girders. The girders rest directly on the substructure. It differs from a **beam bridge** in that the girders are relatively larger and fewer.
  - Built**—A girder made up of structural plates and angles.
  - Circular**—A girder built up in the shape of a circle.
  - Continuous**—A girder with more than two supports.
  - Crane**—(See crane girder.)
  - Cross**—(See cross girder.)
  - Deck**—One of the main girders of a deck bridge.
  - Deck Plate**—One of the main plate girders in a deck bridge.
  - Expansion**—Any girder one end of which is allowed to move.
  - Fascia**—A longitudinal girder at the extreme edge of a structure so finished as to present a neat appearance.
  - Fish Bellied**—A girder having the top flange horizontal and the bottom flange curved in the shape of a fish's belly.
  - Floor**—Any girder which supports a portion of the floor and its load.
  - Framed**—A girder constructed of timbers framed together.
- Girder, I-Beam**—(See I-beam girder.)
- Latticed**—A riveted girder having the upper and lower flanges connected by latticing, or by diagonal bars or angles.
  - Longitudinal**—(See longitudinal girder.)
  - Overhead**—(See overhead girder.)
  - Plate**—A girder built of structural plates and angles, the top and bottom edges of which are covered by steel plates riveted to the flange angles.
  - Riveted**—(See riveted girder.)
  - Skid**—(See skid girder.)
  - Span**—A structural unit or member built of girders, which carries a load across an open area.
  - Stiffening**—A girder employed to give vertical stiffness, as in the case of a suspension bridge.
  - Triangular**—A latticed girder having a system of web members all inclined to the vertical.
  - Truss**—A girder having a latticed web system forming with the flanges a truss in all essential features.
  - Trussed**—A girder stiffened and strengthened by means of trussing.
  - Turntable**—(See turntable girder.)
  - Warren**—(See Warren girder.)
- Girt**—Horizontal members from column to column to carry wall sheaths.
- Longitudinal**—(See longitudinal strut or girt.)
- Glacial Drift**—Any rock material, such as boulders, till, gravel, sand, or clay, transported by a glacier and deposited by or from the ice or by or in water derived from the melting of the ice. Generally used of the glacial deposits of the Pleistocene deposits.
- Scoring**—The scratching and grooving of a rock surface by glacial erosion.
  - Streams**—In geology, these have their water supplied by the melting ice mass, which also furnishes detrital material.

**Glaciation**—The geological action of glaciers; the process of glaciating or state of being glaciated; the overspreading of a large area of the land surface with glacial ice, and consequent production of glacial phenomena, as grooves, and striae on rocks.



*Map of the United States showing approximate area covered by the glaciers. (Modified after Tyler)*

**Glacier**—A stream or sheet of ice, formed by the compacting and recrystallization of unmelted snow accumulated to a great thickness, flowing down a mountain valley or outward across country in all directions from a center of accumulation. When a glacier reaches the sea it often breaks off and forms icebergs.



*(Upper) Diagrammatic sketch showing a region made smooth by glaciation. (Lower) Sketch of a region made rougher by glaciation*

**Glaciology**—That branch of geology which treats of glaciers, of the deposits formed by them, and of results of their action in modifying topography.

**Glance**—A term used to designate various minerals having a splendid luster, as silver glance, lead glance, etc.

—**Pitch**—A pure quality of asphalt.

**Gland**—(aeronautic) A short tube fitted to an envelope or gas bag so that a rope or line may slip through it without leakage of gas or air.

**Glass**—As used in cement technology, this refers to that portion of the liquid produced in clinker during manufacture which solidifies without crystallization.

—The amorphous result of the quick chill of fused lava.

—**Gall of**—(See gall of glass.)

—**Sand**—An extremely pure silica sand, useful for making glass and pottery.

—An extremely pure silica sand useful for making glass and pottery.

—**Wool**—A product with the appearance of clean wool made from silica sand, soda ash, and limestone with or without scrap glass or other materials. (See mineral wool.)

**Glassy**—(rock) Lavas which have cooled so quickly that they are without distinct crystallization.

—**Slag**—Particles of slag having vitreous or glassy surfaces on two opposite faces, leading to the assumption that the glass formation extends through the particle.

**Glauber's Salt**—(See Mirabilite.)

**Glaucinite**—A green amorphous silicate of iron and potassium found in sandstones formed in shallow water.

**Glaucophane**—A blue soda-amphibole found in certain rare schists. A monoclinic amphibole containing sodium, alumina, iron, magnesia, and silica.

- Glazing**—Hard glassy surface covering.
- Glide**—(aeronautic) To descend at a normal angle of attack with little or no thrust.
- Landing**—(aeronautic) A landing in which a steady glide is maintained to the landing surface without of the usual leveling-off before contact.
- Glider**—An aircraft heavier than air, similar to an airplane but without a power plant.
- Gliding Angle**—(aeronautic) The angle between the flight path during a glide and a horizontal axis fixed relative to the air.
- Globulite**—Spheroidal beginnings of crystals.
- Glory Hole**—A large open pit from which ore is being or has been extracted.
- Glossy Print**—(photography) A photograph with shiny or lustrous surface.
- Glyph**—In architecture, a vertical channel, characteristic of the Doric order.\*
- Glyptolith**—A faceted pebble polished by wind action.
- Gneiss**—A medium or coarse-grained crystalline rock possessing some form of parallel structure due either to the uniform orientation of certain tabular or prismatic minerals, or to the presence of wavy discontinuous surfaces indicating a lenticular structure, or of bands of varying mineralogical composition which retain their continuity and parallelism throughout a considerable mass of rock. Some examples are banded gneiss, granite gneiss, etc.
- Gneissic; gneissoid**—Having the appearance or character of gneiss.
- Gold Bonds**—Bonds payable at maturity in gold, if the holder so desires.
- Free**—(See free gold.)
- Goldbeaters-Skin Fabric**—(aeronautic) (See fabric, goldbeaters-skin.)
- Goniometer**—An instrument for measuring the angles of crystals.
- Reflection**—(See reflection goniometer.)
- Goose-Neck Dolly**—A dolly that has a quickly curved bend near one end, with both ends arranged for receiving rivet heads.
- Gorge**—A small canyon. A narrow passage between hills.
- Gossan**—In geology, a term referring to the weathered, iron-stained outcrop of a mineral deposit.
- Gouge**—The finely pulverized rock flour caused by the grinding of two walls in a fault.
- Governor, Air**—A device used on an air compressor for determining range in air pressure over which the compressor operates.
- Graben**—Is a geologically depressed tract of land between two faults. It may actually stand out as an elevation.
- Gradation**—In hydraulics, the bringing of the surface of the earth or any portion of it to a common level or uniform slope; more particularly the bringing of the bed of a stream to a gradient or slope at which the water is just able to transport the material delivered to it.
- In construction, when speaking of aggregates, is the sieve analysis of the materials.
- Grade**—The profile of the center of the roadway, or its rate of rise or fall.
- Elevation**.
- To establish a profile by cuts and fills or earth-work.
- To range by sizes, broken stone, gravel, sand, or combinations of such materials.
- (noun) The ratio of rise, or fall, of the grade line to its length.
- Class of material as compared to a standard.
- (verb) To prepare the ground by excavating or filling according to a definite plan.

- To rate according to a standard.
- 1. Elevation of finished surface of an engineering project.
- Actual elevation, as "crown of road at grade 59.50"; or, "sewer line, grade 21.19 at station 1 + 50.00."
- Rate of slope or degree of inclination, as, "a 2% grade." See, also, Gradient.
- Crossing** (railroad) The intersection of a highway and a railway at the same elevation.
- Line**—The line on the profile representing the tops of embankments and the bottoms of cuttings; and is the intersection of the plane of the roadbed with a vertical plane through the center line.
- Rough**—(See rough grade.)
- Graded Aggregate**—As applied to bituminous paving mixtures, is a term describing a mineral aggregate in which there is a continuous grading in the sizes of mineral fragments from coarse to fine, the coarser sizes being many times the diameter of the finer sizes.
- Terrace**—A terrace having a constant or variable grade along its length.



Photo courtesy R. L. Vazquez

*Easy gradient on Mexico-Apulco road by heavy cuts and fills*

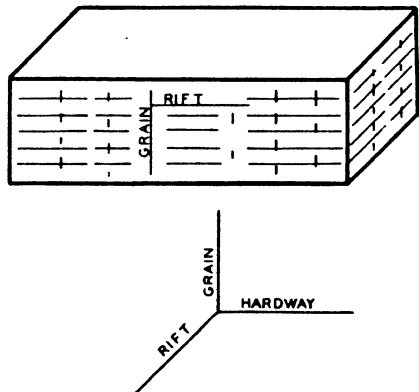
**Gradient**—Rate of rise or fall, as "a 5% gradient," meaning 5 ft. vertical rise in 100 ft. horizontal distance (also recorded as 0.05).

- Rising or descending by regular degrees of inclination.
- The rate of inclination of the grade line from the horizontal.
- Change of elevation per unit length; slope.

**Grafting Tool**—A very strong curved spade used in ditch digging.

**Grahamite**—A brittle, black bitumen with a hardness of 2. Found in West Virginia, Oklahoma and Colorado.

**Grain**—(of rock) Refers to the direction of splitting at right angles to the "rift."



*Sketch illustrating the structure of rock which are closely associated with jointing. The "rift" is the easiest way of splitting, and the "grain" is usually at right angles to the rift. The "hardway" or head grain is the direction at right angles to both the rift and grain*

**Gram**—.0022 of a pound.

- Atomic Weight**—The mass in grams numerically equal to the atomic weight.
- Mole, Gram-Formula Weight, Gram Equivalent**—Mass in grams numerically equal to the molecular

weight, formula weight or chemical equivalent, respectively.

**Granite** — (disintegrated) Granite which has been subjected to natural weathering conditions to the extent that some of the minerals have been altered; e. g., feldspar to kaolin, mica to chlorite, which alterations are accompanied by considerable loss of mechanical strength in the rock structure.

—**Bastard**—(See bastard granite.)

—**Building**—(See building granite.)

**Granites**—Are crystalline, even-grained rocks consisting essentially of feldspar and quartz with smaller amounts of mica and other ferro-magnesian minerals.

**Granitite**—A special name for biotite-granite.

**Granitoid**—A textural term to describe those igneous rocks which are entirely composed of recognizable minerals.

**Granular**—A textural term referring to the uniform size of grains or crystals in a rock.

—**Fracture**—A fracture showing grains or granules on its surface.

—**Lime**—Is the natural quicklime product resulting from the burning in a rotary kiln of a limestone whose physical properties influence or result in a natural breaking down during or immediately following calcination. Granular lime may or may not be selected as to quality. Note—The average particle size of granular lime is usually that which will pass a  $\frac{1}{8}$ -inch sieve.

**Granulated Slag**—The granular product resulting from the very rapid chilling of molten blast furnace slag, usually by water. Granulated slag typically consists of friable, porous grains many of which are under  $\frac{1}{4}$  inch in size.

**Granulating Pit**—A pit used for the water granulation of slag.

**Granule**—A little grain; a small particle.

**Granulite**—A finely crystalline, lam-

inated metamorphic rock consisting of orthoclase, quartz and garnet, but also having at times cyanite, hornblende and biotite.

**Graphics**—The method or process of solving problems by means of drawing lines, the length of the lines representing forces or loads.

**Graphite**—A soft, steel-gray to black, more or less impure, native form of carbon.

**Graphitizing**—Graphitizing is a type of annealing of cast iron whereby some or all of the combined carbon is transformed to free or uncombined carbon.

**Grass Rope**—A term used in some sections for the wire rope used to pull back the skidding line in logging. Also called rehaul line, trip line, outhaul line.

**Grate, Chain**—(See chain grate.)

**Grating**—A grating consists of two sets of parallel bars in the same plane, the sets intersecting at right angles.

**Gravel**—The coarse, granular material, larger than sand, which will not pass a 10-mesh sieve, resulting from the natural erosion of rock.

—**Bank Run**—Normal product of a gravel bank, including pebbles and sand in varying proportions.

—**Pit-Run**—The term generally applied to the mixture of gravel, sand and foreign materials as it occurs naturally in any deposit.

—**Prepared**—The gravel from which dirt, dust, loam and foreign matters have been removed and which has been prepared to meet specifications.

**Gravitation**—The universal attraction existing between all material bodies.

**Gravity**—The force of attraction exerted by the earth on bodies near it. Weight as contra-distinguished from mass.

—**Absolute Specific**—(See specific gravity, absolute.)

—**Apparent Specific**—(See specific gravity, apparent.)

**Gravity, A.P.I.**—(See A.P.I. gravity.)

—**Axis of**—A line passing through the centers of gravity of successive elemental sections of a body.

—**Bulk Specific**—(See specific gravity, bulk.)

—**Center of**—That point in a body about which the weights of all the various portions balance. It is found experimentally by balancing on a knife edge.

—**Conveyor**—In paving brick operations, a conveyor which consists of a series of small rollers elevated at one end on which the brick travel from the piles by the force of gravity until they are taken from the rollers by the dropper gang.

—**Dam**—A dam depending solely on its weight to resist the water load.

—**Ground Water**—In ground water technology, that part of the water in the zone of saturation that will drain into wells is called "gravity ground water."

—**Line of**—The line along which the center of gravity would move, if the body were free to fall.

—**Plane of**—(See plain of gravity.)

—**Solution**—A solution used to separate the different mineral constituents of rocks by their specific gravities, as the solution of mercuric iodide having a maximum specific gravity of 3.19.

—**Specific**—(See specific gravity.)

—**System** (sewage)—A system in which all sewage runs on descending gradients from source to outlet, or where no pumping is required.

—**Water**—Water that moves through soil under influence of gravity; also a municipal water supply in which the flow and pressure are produced by gravity as distinguished from pumping.

**Grayband**—A variety of sandstone for sidewalks; flagstone.

**Graywacke**—An old name of loose signification, applied to metamorphosed, shaly sandstones that yield

a tough, irregularly breaking rock, different from slate on one hand and from quartzite on the other. The components of graywacke may be largely bits of rocks, rather than fragments of minerals.

**Grease, Petroleum Lubricating**—A combination of a petroleum product and a soap or a mixture of soaps, suitable for certain types of lubrication.

—**Trap**—A device by means of which the grease content of sewage is cooled and congealed so that it may be skimmed from the surface.

**Greasy Quartz**—Milk quartz.

**Great Circle**—A circle on the globe cut by any plane through its center. The equator and all meridians are great circles. On account of the spheroidal form of the earth, great circles on its surface are only approximations. Neglecting the effect of spheroidal form, any "straight line" run out with the transit is a part of a great circle.

—**Square**—An area of 10,000 square feet, sometimes used as the unit of street sweeping.

**Greek Masonry**—A style of masonry in which each alternate stone is of the full thickness of the wall.

**Green Marble**—A commercial term for serpentine.

**Greensand**—Sedimentary deposit consisting, when pure, of grains of glauconite which have a dark green color.

**Green Schist**—A general term for those varieties of schists in which hornblende, chlorite, or epidote are abundant constituents.

—**Sludge**—Sludge either untreated or in which the treatment has not proceeded sufficiently to destroy its objectionable features, usually acid, pasty and odorous.

**Greisen**—A granitoid but often somewhat cellular rock, composed of quartz and muscovite or some related mica, rich in fluorine. It is the characteristic mother rock of the ore of tin, cassiterite, and is

in most cases a result of the contact action of granite and its evolved mineralizers.

**Grid**—A system of rectangular coordinate lines, usually superimposed on the projection lines of a topographic map, the Y-axis coinciding with some selected geographical meridian. It is much used for military purposes.

—**Azimuth**—The angle that any given line makes with a north-and-south grid line. It differs from the true azimuth (except at the central or initial meridian) by the amount of the convergence of the meridians.

—**Distance**—The plane distance between two points, as determined from the grid (x, y) coordinates. It may be greater or less than the corresponding ground distance.

**Grillage**—A network of rolled or built beams put in a pier, to distribute the weight from the shoe, or at the bottom of a column to spread quickly the weight over a greatly enlarged area.

—Timbers laid criss-cross, bolted or drifted together and fastened by drift bolts to the heads of foundation piles.

**Grille**—In air conditioning, a perforated covering for an air inlet or outlet usually made of wire screen, pressed steel, cast iron or other decorative materials.

**Grinder, Tool**—A portable tool-sharpening device, with revolving wheel or cone mounted on a spindle rotated by means of gears, and operated by hand, foot or other power. It is usually provided with attachments for holding the tools in proper position while being ground.

**Grindstone**—A tough sandstone of fine and even grain, composed almost entirely of quartz, mostly in angular grains.

—In sewage technology, the heavy mineral matter deposited from sewage.

—**Chamber**—A chamber or enlarged channel in which the cross section of sewage flow is so designed that the velocity is such that only heavy solids, such as grit and sand, are deposited, while the lighter organic solids are carried forward in suspension.

**Grip** (of a bolt)—The length of a threaded bolt measured from inside of the head to inside of the nut when the latter is screwed on far enough to provide full thread.

**Grit**—In geology, a coarse sand or sandstone formed mostly of angular quartz grains. The term also refers to stone or slag chips.

**Groin**—A jetty built at an angle to the shore line. It may be either permeable or solid.

—In stone masonry, the curved intersection of two arches meeting at an angle.

**Grommet**—In wharf construction, a segmental concrete ring, cast in two parts that overlap to open and close by a spring, and used suspended from a concrete pile jacket. As the jacket is lowered over a pile the grommet at the bottom of the jacket is held close to the pile by a spring and keeps mud from coming up in the jacket.

—From the nautical term applied to an eyelet of rope.

—(wire rope) A circular thimble, usually solid.

—**Sling**—An endless ring of rope made out of a single continuous piece of strand.

**Grooving**—Localized corrosion of boiler steel, in strained areas, occurring in well-defined lines.

**Gross Charge**—A sum on the debit side, representing the entire amount or total of the charges resulting from any transactions before credits are deducted.

—**Cost**—The total outlay incurred in any transaction, including the money value of services rendered and other considerations involved before credits are deducted.

- Credit**—A sum representing the entire amount or total of credits resulting from any transactions before debits are deducted.
- Duty of Water**—The irrigation water diverted at the intake of a canal system, usually expressed in depth on the irrigable area under the system; diversion requirement.
- Lift** (aerostat)—The buoyancy under standard conditions of density, purity, and fullness.
- Weight** (airplane)—The total weight of an airplane when fully loaded (cf. load, full).
- Ground Angle**—Same as landing angle.
- Blue**—(See blue ground.)
- Control**—(See Control.)
- Cover, Low**—Used in roadside development to denote woody shrubs or vines planted on highway slopes to control erosion, in extended groups or colonies.
- Gear**—The gear, or equipment, necessary for the landing and handling of an airship on the ground.
- Lime**—The product resulting from the mechanical crushing or grinding of run of kiln or non-selected quicklime to a particle size which varies according to a definite specification or use.
- Loop**—An uncontrollable violent turn of an airplane while taxiing, or during the landing or take-off run.
- Moraine**—In geology, the irregular sheet of till deposited partly beneath the advancing glacier and partly directly from the ice when it melts away.
- Plane**—(photographic mapping) The assumed horizontal plane to which the details of an aerial photograph are referred.
- Shells**—The product obtained by grinding the shells of mollusks so that not less than 50 per cent shall pass a 100-mesh sieve.
- Shell Marl**—The product obtained by grinding natural deposits of shell marl so that at least 75 per cent will pass a 100-mesh sieve.
- Ground Speed**—The horizontal component of the velocity of an aircraft relative to the ground.
- Swell** (of trees)—That portion of the tree that enlarges or flares out just above the ground line.
- Water**—That which is standing in, or passing through, the ground. The subsurface water in the "zone of saturation." It supplies springs and wells.
- Water Level**—A less technical synonym for ground water table.
- Water Table**—The upper surface of the zone of saturation in permeable rock or soil. When the upper surface is confined by impermeable rock, the water table is absent.
- Wire**—In electricity, that wire extending from the frame of an electrical device to the ground.
- Groundmass**—In petrography, the matrix or fine-grained interstitial matter of rock which envelops the larger constituents.
- Groundsill**—A bed piece of foundation timber supporting a timber superstructure as a set of mine timbers.
- Grouping**—Segregating various things, methods or processes into classes.
- Grouser**—A heavy lug attached to crawler tread plates and tractor wheels to obtain better traction in soft ground.
- Grout**—(noun) A fluid mixture of cement, sand, and water, that can be poured easily.
- A term applied to the waste material of all sizes obtained in quarrying stone.
- (verb) To fill the joints and smaller voids in masonry with grout.
- Grouted Rubble Gutter**—Consists of stones 6 to 8 inches in size, laid on a broken stone or gravel foundation about 4 inches deep. After compaction, the voids are filled with broken stone, after

- which cement grout is poured in and broomed.
- Grow-On**—Quarrymen's term to designate the place where the sheet structure dies out, or the place where two sheets appear to grow onto one another.
- Grubber Rope**—A wire rope used for clearing stumps from land.
- Grubbing**—Removing the stumps and roots.
- Gruss**—The fragmental products of the weathering of granite in its passage to soil.
- Guano**—A substance found in great abundance on some coasts or islands frequented by sea fowls and composed chiefly of their excrement. It is rich in phosphates and nitrogenous matter.
- Guaranteed Bonds**—When a company other than the original issuer guarantees the payment of an issue of bonds, they are spoken of as guaranteed or endorsed or assumed bonds.
- Guard Felloe**—A guard rail on a roadway, so placed as to catch the tire of a wheel and thus protect the structure.
- Rail**—A rail or other structure laid parallel with the running rails of a track to prevent wheels from being derailed; or to hold wheels in correct alinement to prevent their flanges from striking the points of turnout or crossing frogs or the points of switches.
- A rail or other structure laid parallel with the running rails of a track to keep derailed wheels adjacent to running rails.
- A fence built along highway embankments on the shoulder of the fill.
- (of a bridge) The raised portion of a bridge floor which prevents vehicles from leaving the traveled portion.
- Timber**—A longitudinal timber placed outside of the track rail to maintain the spacing of the ties.
- Guide Rail**—In railway work, same as guard rail.
- Rope**—(aeronautic) (See drag rope.)
- Timber**—Wooden stringers or rails for controlling the line and grade of a movable unit.
- Guilloche**—In architecture, an interlocking ornament frequently used to decorate the torus molding.\*
- Gully**—A ditch eroded in the surface of earth.
- Control**—In soil erosion control, regulation of gully erosion by mechanical or vegetal means.
- Erosion**—Carrying off of the soil by the action of water flowing in distinct channels or ditches.
- Head**—The upstream terminal of a gully.
- Gumbo**—The natural soil found in certain parts of the middle west, notably Minnesota, the Dakotas, Missouri and Iowa, which are finely divided clays of varying capillarity.
- Guncotton**—A highly nitrated cotton containing about 13 per cent of nitrogen and only slightly soluble in ether-alcohol.
- Gunitite**—Mortar placed with a cement gun.
- Gun Metal**—An alloy, commonly composed of nine parts copper and one part tin.
- Gunpowder**—A black or brown explosive substance, consisting of an intimate mechanical mixture of saltpeter, charcoal, and sulphur, used in gunnery and blasting. It consists of 70 to 80 per cent saltpeter, and 10 to 15 per cent each of the other ingredients.
- Ordinary Black**—An intimate mixture of potassium nitrate, sulphur, and charcoal.
- Gunter's Chain**—The chain commonly used in surveying, having 100 links, each 7.92 inches long.
- Gurlet**—A mason's pickax having one cutting edge and a point.
- Gusset**—An angular piece of iron or steel, or a steel plate fastened to

- angles, channels, or the members of a structure to give strength and stiffness to them, or to connect them to the construction.
- Plate**—A connecting plate used at panel points to join the chord and the web members together.
- Gutta Percha**—The juice of certain tropical trees valued for its insulating properties.
- Guttae**—In architecture, small drops or truncated cones or pyramids under the mutules and triglyphs of the Doric order.\*
- Gutter**—The artificially surfaced and generally shallow waterway, provided usually at the sides of the roadway for carrying surface drainage. Occasionally used synonymously with ditch, but incorrectly so, as gutters are always paved or otherwise surfaced, and ditches are not.
- And Parking Strips** (brick)—Brick pavement adjacent to the curbs of varying widths, constructed in conjunction with another type of pavement, usually some form of bituminous concrete.
- Guy**—A line for bracing the top of a pole, derrick, or any other similar apparatus.
- A stay-rope passing from the top of a spar or mast to a post in the ground, or other anchor, as the guys of a derrick.
- Rope**—A wire rope used for holding masts, poles, towers, etc., upright.
- Strand**—A single strand of twisted wires used for holding upright smokestacks, poles, etc.
- Gypsum**—Hydrous calcium sulphate,  $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ . Contains 32.5 per cent lime, 46.6 per cent sulphur trioxide, and 20.9 per cent water. Some varieties are alabaster, gypsum, satin spar, and selenite.
- Calcined**—(See calcined gypsum.)
- Concrete**—A combination of aggregate or aggregates with gypsum as a binding medium, which after mixing solidifies into a conglomerate mass.
- Fiber Concrete**—Gypsum concrete in which the aggregate consists of shavings or chips of wood.
- Land Plaster or Crude Calcium Sulphate**—Products consisting chiefly of calcium sulphate and may contain 20 per cent of combined water.
- Lath**—A gypsum plaster board, designed to be used as a base for the reception of gypsum plaster.
- Gyration, Radius of**—The radius of gyration of a body about a given axis is the distance from the axis of rotation to the center of gyration, and is equal to the square root of the mean of all squares of the distances from the axis of rotation to all points in the body.
- Gyratory Breaker**—A rock crusher built on the principle of the old-fashioned coffee mill. It consists of a vertical spindle the foot of which is mounted in an eccentric bearing within a conical shell. The top carries a conical crushing head revolving eccentrically in a conical man.
- Gyro, Directional**—(aeronautic) (See directional gyro.)
- Horizon**—A gyroscopic instrument that indicates the lateral and longitudinal attitude of the airplane by simulating the natural horizon.
- Pilot**—(aeronautic) (See automatic pilot.)
- Gyroplane**—A type of rotor plane whose support in the air is chiefly derived from airfoils rotated about an approximately vertical axis by aerodynamic forces, and in which the lift on opposite sides of the plane of symmetry is equalized by rotation of the blades about the blades' axes.
- Gyrostat**—An instrument for demonstrating the dynamics of rotating bodies.

# H

**H-pile**—Any steel H section used as a bearing pile.

**Haas Tester**—An instrument for obtaining the flashing point of petroleum.

**Hack Hammer**—A hammer resembling an adz, used in dressing stone.

**Hackly Fracture** (of a mineral)—A fracture in which the surface is irregular with sharp edges.

**Hair Crack**—An irregularly running, fine, narrow crevice or fissure at the surface of a concrete or clay product not penetrating deeply.

**Half-Turn Socket**—In oil-well drilling, a fishing tool having jaws bent around in an incomplete circle, to engage lost tools that lean to one side of the well.

**Halite**—Natural sodium chloride, NaCl. Rock salt.

**Hammer, Air**—A machine hammer driven by compressed air, as an air riveting hammer.

—**Bust**—(See bust hammer.)

—**Drop**—A heavy weight, working in guides, which is raised and then allowed to drop.

—**Flogging**—A very large hammer used with a flogging chisel for chipping iron castings.

—**Hack**—(See hack hammer.)

—**Holding-Up**—(See holding-up hammer.)

—**Mill**—A crushing machine consisting of rows of hammers hung loosely from bolts running through discs, all mounted on a substantial shaft and enclosed in a suitable housing. Revolving at high speed, the hammers break the material against the breaker plate, then carry it back over the cage, where oversize material is subjected to further blows of hammers until of

the proper fineness to pass through the openings.

—**Peen**—A hammer having a straight or ball head on one or both faces.

—**Power**—A hammer used for forging work.

—**Tongs**—A pair of tongs which is designed for picking up the handles of tools or hammer heads which are red hot.

—**Water**—(See water hammer.)

**Hammer-dress**—To dress or face stone with a hammer.

**Hand Level**—A small instrument consisting of a telescope with a bubble tube so attached that the position of the bubble can be seen when looking through the telescope.

—**Rope**—A soft flexible wire rope used to operate valves, switches, etc., inaccessibly located.

**Handling Line** (aerostat)—A line attached to the side of an airship or balloon for use by the ground crew in handling the aerostat.

—(airplane)—Two lines of steel strand attached to the upper wings of a seaplane for steadying it when hauled out of the water aboard ship.

**Handrail**—A railing of concrete, stone, wood, or metal placed on top of posts or balusters to form an open-work construction. Used on the sides of bridges to prevent persons and animals from falling off.

**Hangar**—A shelter for housing airplanes.

—**Plate**—A gusset plate connecting the hip-vertical to either the top or the bottom chord.

**Hanger** (through arch)—A vertical tension member transmitting the load to the arch rib.

**Hanging Valley**—A valley the floor of which is notably higher than

the level of the valley or shore to which it leads.

**Haplite**—A name for that variety of granite which consists of quartz and potash feldspar.

**Harbor Line**—(inner and outer) The lines defining the limits of a port or haven with regard to inner or best protected area and outer or less protected area. Often referred to in port regulations.

—In certain locations of the country inner harbor line is synonymous with bulkhead line and outer harbor line with pierhead line.

**Hard Asphalt**—Solid asphalt which has a normal penetration of less than 10. To make it suitable for ordinary use it must be softened to desired consistency by combining it with flux oil.

—**Coal**—(See anthracite.)

—**Head**—A large, smooth, rounded stone found especially in coarse gravel. A nigger head.

—**Rubber**—Vulcanized India rubber.

—(water) The quality of water due to incrusting solids held in solution. It is expressed preferably as parts of  $\text{CaCO}_3$  per million gallons, or grains per gallon. 17.1 ppm. equals 1.0 grains per gallon, or 1.20 degrees (Clark).

**Hardening** (of concrete)—The indefinitely slow completion of the process of stiffening or crystallization in cement concrete continuing after the so-called final set, in which process the concrete attains its useful bearing power.

**Hardness**—Intensity of molecular cohesion as measured by the resistance to penetration by a standard tool.

—The quality of being firm and solid; not easily penetrated. The hardness of coarse aggregate is measured by the resistance to the grinding action of an abrasive agent like sand, when tested in the Dorry Hardness Machine. The hardness of metallic minerals is generally measured by the resist-

ance to penetration of a standard steel or diamond ball applied to the surface of the metal for a definite length of time under a specified load.

—(minerals) The cohesion of the particles on the surface of a body as determined by its capacity to scratch another, or be itself scratched. The hardness of a mineral is relatively constant. For convenience, all minerals are referred to a scale of hardness of ten units composed of common or well-known minerals as follows:

1 talc	6 orthoclase
2 gypsum	7 quartz
3 calcite	8 topaz
4 fluorite	9 corundum
5 apatite	10 diamond

**Hardpan**—An horizon of accumulation that has been thoroughly cemented to an indurated, rock-like layer that will not soften when wet. The term hardpan is not properly applied to hard clay layers that are not cemented, nor to those layers that may seem indurated when dry but which soften and lose their rock-like character when soaked in water. The true hardpan is cemented by materials that are not readily soluble, and is a hard layer that definitely and permanently (in nature) limits downward movement of roots and water.



*Photo courtesy R. L. Varquez  
Hardpan surfacing on Mexico-  
Laredo highway*

**Hardway**—(rock) The direction at right angles to both rift and grain

- in which granite does not split readily.
- Hardwood** (tree)—Wood from a tree which is sturdy, with a texture of growth, not given to easy breakage; oak, "hard" maple, hickory.
- Hardy Hole**—A hole in a blacksmith's anvil for the insertion of a calking tool or other pieces.
- Harmonic**—In acoustics, a component of a periodic wave or quantity having a frequency which is an integral multiple of the fundamental frequency.
- Analysis**—(of tides) The mathematical process by which epochs and amplitudes of component tides are disentangled from actual tidal observations.
- Harrisite**—A granitoid igneous rock with olivine predominant over anorthite.
- Hartford Connection or Underwriter's Loop**—In heating terminology, an arrangement of piping used on low pressure steam boilers to prevent water being backed out of the boiler into the returns when the pressure in the boiler exceeds that in the returns. The wet return is brought up to the level of the water line of the boiler where it meets an equalizer pipe connecting to the supply header before dropping again to the return inlet.
- Harzburgite**—Peridotites that consist essentially of olivine and enstatite or bronzite.
- Hassam Pavement**—A concrete pavement made by grouting broken stone with Portland cement mortar and rolling with a roller.
- Haul**—The distance grading material is moved in the construction of the roadway.
- Average**—(See average haul.)
- Free**—(See free haul.)
- Road**—A road used to deliver material from a supply point to a job.
- Haunch**—The part of an arch between the crown and the skew-back.
- Sometimes refers to the quarter point of a roadbed.
- (plural) The lower quarter segments of a pipe.
- Hawser**—A wire rope used for towing ships.
- Head**—(static) The height of water above any point or plane of reference. The difference in elevation between the surface of water at the source of supply and the elevation at any given point; or the difference in elevation between the surface of water at inlet and outlet. (See hydrostatic pressure.)
- In hydraulics, the height of water above any plane of reference; the energy of a given nature possessed by each unit weight of a liquid expressed as the vertical height through which a unit weight would have to fall to release the average energy possessed.
- Air-Speed** (aeronautic)—(See air-speed head.)
- Boring**—(See boring head.)
- Button**—The end of a bar, bolt, or rivet having the shape of a button.
- Chord**—The enlarged end of a chord bar through which the pin passes.
- Friction**—The resistance due to friction through pipe lines, pumps and fittings when discharging a given quantity of water.
- Measurement**—The following are the standard methods for measuring the distance to the pumping water level of deep well turbine pumps: (a) Direct measurement using steel tape and suitable float; (b) direct measurement by using electric contact and insulated wire sounding line; (c) air line method using calibrated depth gauge.
- Pumping**—Static head plus friction head when discharging a given quantity of water.
- Race**—A channel leading water to a waterwheel.
- Rope**—The "pulling out" rope on a haulage system in mines.
- Standard Unit of**—The unit for

measuring head shall be the foot. The relation between a pressure expressed in pounds per square inch and that expressed in feet of head is:

$$\text{Head in feet} = \frac{\text{lb./sq. in.} \times 144}{\text{Density in lb./cu. ft.}}$$

For water at 68° F.

1 lb./sq. in.=2.310 ft.

—**Suction, Dynamic**—(See dynamic suction head.)

—**Total**—The difference in elevation between the surface of water at the source of supply and the elevation of the water at the outlet plus velocity head and plus friction head.

—**Total Dynamic** (symbol T.D.H.)—The total dynamic head on a pump is the difference between the elevation corresponding to the pressure at the discharge flange of the pump and the elevation corresponding to the vacuum or pressure at the suction flange of the pump, corrected for the same datum plane, plus the velocity head at the discharge flange of the pump minus the velocity head at the suction flange of the pump.

—**Total Pumping**—The total head on which the horsepower of deep well power and deep well centrifugal pumps shall be determined is the distance from the water level of the well when pumping to the center line of the discharge nozzle of the pump at the surface, plus the total discharge head measured at the discharge nozzle.

—**Velocity**—(See velocity head.)

**Header**—A stone which has its greatest length at right angles to the face of the wall, and which bonds the face stones to the backing.

—The closing plate on the end of a sewer lateral which will not be used immediately.

—**Flume**—A flume, chute, trough, or lined canal used at the head end of a gully or at a terrace outlet to prevent cutting.

—A structure installed at the head

or upper end of a gully to prevent overfall cutting.

—A timber, concrete, or stone stretcher across the subgrade of a pavement laid flush with the pavement surface against which the paving slab butts.

**Head-Gate**—The control works, or the gate itself, at the entrance to a conduit.

**Heading**—(rock) A collection of joints.

—The complete works at the upper end of a main canal, including diversion dam, head-gates, spillways, etc., intake; head-works.

—**Tool**—A tool for the swaging of bolt heads.

**Head-Race**—A channel leading water to a waterwheel; a forebay.

**Headwall**—A wall of stone, metal, concrete or wood at the end of a culvert or drain to serve one or all of the following purposes: protect fill from scour or undermining, increase hydraulic efficiency of conduit, divert direction of flow, retard disjuncting of short sectional pipe, and to serve as a retaining wall.

**Headwater**—The source of a stream; the water just upstream from a structure.

**Headworks** (hydraulics)—The diversion structures at the head of a conduit; an intake heading.

—The diversion structure at the head of a canal; intake.

**Healing Stone**—A slate or tile for roofing.

**Heartwood**—The inner, dead portion of the wood in a tree.

**Heat**—(of steel) The steel from one melt in one furnace. A term of identity which follows this steel from the time of charging the furnace through all intermediate operations to the finished product. Usually "heat" is used to apply to open-hearth steel, "melt" to Bessemer steel. Mill records are maintained of all heats or melts.

—**Latent**—(See latent heat.)

- Of Combustion**—Of a substance is the amount of heat evolved by the combustion of 1 gram molecular weight of the substance.
- Of Hydration**—As used in cement technology, this refers to heat evolved during any given time period following the mixing of the cement with water.
- Of Solution**—The heat evolved when a material is dissolved in any specified solution.
- Penetration**—In welding, the combined depths of the fusion and refined zones below the original surface and/or edge planes of the base metal.
- Sensible**—(See sensible heat.)
- Treatment**—An operation or combination of operations involving the heating and cooling of a metal or an alloy in the solid state.
- Heaviness, Nose** (aeronautic)—(See noseheavy.)
- Stern** (aeronautic)—(See sternheavy.)
- Tail** (aeronautic)—(See tailheavy.)
- Wing** (aeronautic)—(See wingheavy.)
- Heavy Sludge**—Sludge as first drawn, or in which the moisture content has not been reduced to 55 per cent.
- Hecto Ampere**—In electricity, a unit of electric current or 100 amperes.
- Hedrumite**—A name for certain syenitic rocks that are poor or lacking in nephelite, but have a trachytic texture.
- Heel**—The lowest upstream edge of a dam or structure.
- The mouth or collar of a bore hole.
- Height of Instrument** (H. I.)—1. (spirit leveling) Vertical distance from datum to line of sight of instrument. 2. (stadia leveling) Height of center of transit (axis) above the station stake, or the ground beneath, whichever is used as rod point. (In the second definition the height is small, and is limited by the height of the observer or his instrument. In the first definition it may be great, depending upon the elevation of the station with respect to the datum. "Elevation of line of sight" (E.L.S.) has been suggested as a substitute for the H. I. of spirit leveling.)
- Height, Pressure**—The altitude at which the gas cells of a rigid airship or the gas bag of a nonrigid airship are completely full of gas.
- Helical**—The curve formed on any cylinder by a right line in a plane that is wrapped round the cylinder, as an ordinary screw thread.
- Helicopter**—A type of rotor plane whose support in the air is normally derived from airfoils mechanically rotated about an approximately vertical axis.
- Helix**—In electricity, a conductor coiled into a cylindrical spiral.
- Hematite**—One of the commonest ores of iron,  $\text{Fe}_2\text{O}_3$ , which, when pure, contains about 70 per cent of metallic iron and 30 of oxygen.
- Henry's Law**—The amount of gas which a liquid will dissolve is directly proportional to the pressure of the gas. This holds for all gases which do not unite chemically with the solvent.
- Hertzian Waves**—Electromagnetic waves.
- Hessite**—A telluride of silver having the formula  $\text{Ag}_2\text{Te}$ . Contains about 37 per cent tellurium and 63 per cent silver.
- Hexastyle**—In architecture, a facade treatment having six columns in a row.\*
- Hick-Joint**—A system of masonry-pointing in which the mortar between the courses is flush with the face of the wall.
- Hicky**—A purely field expression, employed by bridgemen for almost any contrivance, or part of one, which lacks a specific name. Analogous to "thingumbob."
- Hiding Power**—The power of a paint

or paint material as used to obscure a surface painted with it. (The word "obscure" as used in this definition means to render invisible or to cover up a surface so that it cannot be seen.)

**High Carbon Steel**—Any steel having high carbon content. Usually referring to steels in which the principal element, apart from iron, is carbon. This term is relative. Generally speaking, steels of approximately 0.45 per cent carbon or greater are considered high carbon. Frequently hard grade billet reinforcement bars and rail steel reinforcement bars are termed high-carbon bars.

—**Early-Strength Cement**—Is the product obtained by pulverizing clinker consisting essentially of calcium silicates, to which no additions have been made subsequent to calcination other than water and/or untreated calcium sulfate. (Chemical and strength specifications by the A.S.T.M.)

#### CHEMICAL LIMITS

	Limits	Tolerance
Loss on ignition, %	4.00	0.25
Insoluble residue, %	0.85	0.15
Sulfuric anhydride, %	2.50	0.10
Magnesia, %	5.00	0.40

#### STRENGTH REQUIREMENTS

(The average strength in pounds per square inch of not less than three standard specimens shall be equal to or higher than the following):

Age at test days	Storage of specimens	Option 1 Tensile strength p.s.i.	Option 2 Compres- sive str'gth p.s.i.
1	1 day in moist air	275	1300
3	1 day in moist air, 2 days in water	375	3000

(Chemical and strength specifications of the Federal Specification Board.)

#### CHEMICAL LIMITS

(The following limits shall not be exceeded):

	%
Loss on ignition	3.00
Insoluble residue	0.75
Sulfuric anhydride	2.50
Magnesia	5.00
Alumina	7.50
Iron oxide	6.00
Tricalcium aluminate	15.00

#### STRENGTH REQUIREMENTS

Age, days	Tensile strength, p.s.i.
1 Not less than	275
3 Not less than	375
7 Not less than	425

—**Pass Wave Filter**—In acoustics, a selective transducer which efficiently passes waves of all frequencies down to a certain frequency—called the cut-off frequency—and effectually bars waves having frequencies lower than the cut-off frequency.

—**Tension**—In electricity, meaning high voltage.

—**Water**—The maximum height reached by rising water or tides (abbreviated H. W.).

**High-Wing Monoplane**—A monoplane in which the wing is located at, or near, the top of the fuselage.

**Hilly**—A land slope classification used in correlating run-off and topography. Land with slopes averaging 10 to 30 per cent. Opposed to flat or gently sloping topography.

**Hinged Arch**—(See arch, hinged.)

—**Posts**—A post having one or both ends connected by pins to other parts of the structure.

**Highway**—The whole right of way or the whole area which is reserved for use in the construction and maintenance of the public roadway, including its appurtenances and the improvement of the roadsides. (See street.)

—**Construction**—Building work which includes roads, streets, alleys, sidewalks, guard rails and fences, parkways, parking areas, airports, bridle paths, athletic fields, highway bridges and culverts, grade separations involving highways, etc.

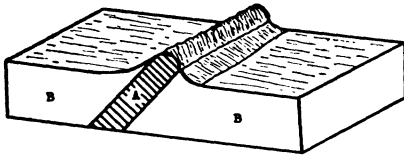
**Hip**—The place at which the top chord meets the batter-brace or inclined end post.

—**Vertical**—The upright tension member attached to the pin or to the plates at the hip of a truss and

carrying a floor beam at its lower end.

**Hit or Miss** (lumber)—Surfaced lumber on which a series of skipped spots are not surfaced.

**Hogback**—A ridge formed by the outcropping edge of tilted strata; hence any ridge with a sharp summit and steeply sloping sides.



*A hogback, due to the slower erosion of a resistant stratum. (A) resistant stratum; (BB) softer surrounding rock. (After Lahee.)*

**Hog-Chain Truss** — Properly, a trussed beam.

**Hoist**—A machine for lifting weights or loads of various kinds. To elevate by means of block and tackle or by machinery of any kind.

—**Cable**—A hoist in which cables winding about a drum or drums are used to lift the load.

**Hoisting Jack**—A lifting device in which a screw-jack is employed.

**Holder-up**—A dolly bar for bucking up rivets. Called also "bucker-up."

**Holding Company**—A holding company is one which, through stock ownership, controls other companies.

—**Rope**—The wire rope used on clamshell and orange peel buckets for opening the bucket and supporting it in the open position.

**Holding-Up Hammer**—A heavy engineer's hammer on a long handle, used in times past for bucking up rivets.

**Hole, Cat**—(See cat hole.)

—**Cut**—(See cut holes.)

—**Glory**—(See glory hole.)

—**Hardy**—(See Hardy hole.)

**Hollow Dam**—A barrier in a canyon, arroyo or gully, usually of reinforced concrete, consisting essentially of slabs supported by trans-

verse buttresses. The load is taken by the slabs and transferred to the foundations through the buttresses.

—**Quoin**—The vertical, semi-circular groove in the masonry into which fits the "quoin post," or hinge post, of a canal lock gate.

**Holocrystalline** — In petrography, completely crystalline structure without glass.

**Homogeneous Steel**—A steel solid and free from blow holes. A variety of crucible steel easily bent and worked.

**Hone** (verb)—To plane off or cut down an irregular or highly crowned surface, usually an untreated road surface or earth road.

**Honeycomb**—(aeronautic) A grid of intersecting surfaces used to check lateral disturbances in a fluid stream.

—**Slag**—An unusually light form of air-cooled slag which has a multiplicity of large cells, and thin cell walls.

**Honeycombed** (concrete)—A poorly filled or compacted, or a porous concrete mass.

**Hood, N.A.C.A.**—The ring portion of an N.A.C.A. cowling.

**Hook, Arresting**—A hook attached to an airplane which engages the arresting gear in landing.

—**Gage**—A pointed hook attached to a graduated staff or vernier scale for accurately measuring the elevation of the surface of still water. The hook is submerged, and then raised until the point makes a pimple on the water surface.

**Hooke's Law**—Within the elastic limit of any body the ratio of the stress to the strain produced is constant.

**Hopper Car**—An open top railroad or industrial car with a trap bottom to permit dumping by gravity.

**Horizon, Artificial**—(aeronautic) (See artificial horizon.)

**Horizontal**—Parallel to a water table.

- Bracing**—Bracing lying in a horizontal plane.
- Compressor**—A machine which has the compressing element in a horizontal position.
- Curve**—In roadbuilding, a curve in plan or alignment of a highway.
- Flow Tank**—A tank or basin, with or without baffles, in which the direction of flow is generally horizontal.
- Split Head**—A horizontal progressive fracture originating in the interior of the head of a railroad rail, usually indicated on the side of head by longitudinal seam or crack and flow of metal.
- Sway Bracing**—Sway bracing in a horizontal plane.
- Tail Area**—The horizontal tail area is measured in the same manner as the wing area, that is, with no deduction for the area blanketed by the fuselage, such blanketed area being bounded within the fuselage by lateral straight lines that connect the intersections of the leading and trailing edges of the stabilizer with the sides of the fuselage, the fairings and fillets being ignored.
- Truss**—A truss placed in a horizontal plane.
- Horn**—A short lever attached to a control surface of an aircraft, to which the operating wire or rod is connected.
- Quicksilver**—Mercurous chloride,  $\text{Hg}_2\text{Cl}_2$ . Calomel.
- Hornfels** — (rock) A fine-grained, compact, highly metamorphosed rock, the original texture of which has been completely obliterated by the heat of an adjacent intrusion.
- Hornstone**—(rock) A fine, hard, tough rock which is usually rich in finely crystalline silica.
- Horse**—In geology, a large fragment of rock broken from one block and caught between the walls of the fault.
- Horsepower**—A unit of power numerically equal to a rate of 33,000 foot-pounds of work per minute.
- Field**—The laboratory shaft horsepower on a deep well turbine pump to which has been added the shaft loss for the particular installation.
- Of an Engine, Rated**—The average horsepower developed by a given type of engine at the rated speed when operating at full throttle, or at a specified altitude or manifold pressure.
- Horseshoe Riveter**—A form of yoke riveter hung from a traveling crane, so as to be readily moved about the shop to reach different parts of a job.
- Horst**—A tract of the earth's crust separated by faults from the surrounding tracts which have been relatively depressed.
- Hose**—In welding, a flexible conductor for supplying the gases to welding or cutting equipment.
- Hotbed**—In steel plant, a series of skids on which railroad rails are placed for cooling after rolling, sawing and cambering.
- Hot Chisel**—A chisel for cutting hot metal; distinguished from cold chisel.
- Mix**—A general term for bituminous compositions that must be heated over 275 deg. F. to be properly prepared and handled. (See hot-laid mixtures.)
- Saw**—A circular saw for cutting hot bar-iron in small pieces.
- Hot-Drawn**—A term used to signify the product of drawing, when the operation is performed on material that is hot, usually red hot.
- Hot-Laid Mixtures**—Plant mixes of bitumen and aggregates which must be spread and compacted while in a heated condition. They are prepared directly with bituminous cements and lose their workability when cooled to atmospheric temperature.

- H. O. (hot oil)**—Asphalt of such consistency that it must be heated above 225 deg. F. to be applied effectively.
- Hot-rolled, Cold-rolled**—As applied to steel, these terms indicate the manner of rolling. In most rolled products, both hot and cold rolled, the principal reduction from billet to bar is done by rolling while hot. In hot-rolled steel the entire rolling, including the finishing pass, is done hot, whereas in cold-rolled steel one or two light-draft finish passes are made cold. Usually cold rolling is for special purpose steels, not for structural materials or reinforcement bars.
- House Connection**—A pipe leading from a building to a common sewer.
- Housing**—The casing for a machine or part thereof.
- H. T. (hot tar)**—Tar of such consistency that it must be heated above 175 deg. F. to be applied effectively.
- Hub**—Wooden peg used in surveying as a turning point and center line reference point.
- Dynamometer (aeronautic)** — (See dynamometer, hub.)
- Hue**—The predominating spectral color in a color mixture.
- Humidity, Relative**—(See relative humidity.)
- Humidostat**—A device to regulate atmospheric humidity.
- Hummock**—A small elevation; hillock; a pile or ridge of ice on an ice-field.
- Hump Speed**—The speed of a sea-plane during take-off at which the float resistance reaches a maximum.
- Humus**—A dark brown substance, formed usually in the soil, due to the partial decomposition of vegetal matter; the organic portion of the soil.
- Sludge**—(1) Digested sludge deposited in final or secondary settling tanks, following trickling filters or other oxidizing device.
- (2) Sludge resembling humus in appearance.
- Hyaline**—A synonym for glassy, which is often prefixed to the name of volcanic rocks to signify a glassy development of the constituents.
- Hydrated Lime**—A dry powder obtained by treating quicklime with water enough to satisfy its chemical affinity under the conditions of its hydration. Note—It consists essentially of calcium hydroxide or a mixture of calcium hydroxide and magnesium oxide and magnesium hydroxide.
- Hydration**—In cement technology, a combination of a compound with water to form a hydrate.
- Hydraulic**—Pertaining to water.
- Elements**—The depth, area, wetted perimeter, mean depth, hydraulic radius, velocity, energy, and other quantities involved in the flow of water in pipes and channels.
- Fill**—(levee) A levee in which the fill material is transported and deposited in place by means of water pumped through a pipe line.
- Fill Dam**—A dam composed of earth, sand, gravel, etc., sluiced into place; generally the fines are washed toward the center for greater imperviousness.
- Fills**—In highway construction, especially over marshy country or along shores of rivers or lakes, hydraulic fills are sometimes used. The common practice is to build up dikes along each side of the proposed road and then pump material into place between the dikes by means of a hydraulic dredge.
- Grade Line**—In a closed conduit, a line joining the elevations to which water could stand in risers open to atmospheric pressure.
- In an open channel, the hydraulic grade line is the free water surface.**
- Gradient**—The slope of the hydraulic grade line. The slope of

the free surface of water flowing in an open channel.

**Hydraulic Hoist**—A lifting mechanism operated by the power of confined oil under pressure in a cylinder acting on a piston head.

—**Jump**—The sudden and usually turbulent passage of water from low stage below critical depth to high stage above critical depth.

—**Jump** (sewage)—Condition where surface of the sewage stands normal to the invert approximately where change of velocity occurs.

—**Limestone**—A limestone which contains some silica and alumina and which yields a quicklime that will set or form a firm, strong mass under water, as in hydraulic cements.

—**Press**—A press consisting of a water cylinder and movable plunger mounted in a frame. A small pump forces water into the cylinder and causes the plunger to move slowly, but with great pressure against the object held in the frame.

—**Radius**—The right cross-sectional area of a stream of water divided by the length of that part of its periphery in contact with its containing conduit; the ratio of area to wetted perimeter.

—**Ram**—A machine for raising water by utilizing the momentum of water flowing by gravity through a pipe to lift a portion of the water to an elevation greater than the source of supply.

—**Sluicing**—The process of removing materials by water. (Set hydraulicking.)

**Hydraulic-Fill Dam**—An earth dam in which the central portion is of fines sluiced into place by water.

**Hydraulicking**—The use of water under pressure and directed against the face of the material to be recovered. This material is dislodged by the force of the water and carried away. Hydraulicking is also used for the removal of

overburden from deposits of rock or ore.

**Hydrocarbon**—A chemical compound consisting of hydrogen and carbon.

**Hydrofoil** (or hydrovane)—Any surface designed to obtain reaction from the water through which it moves.

**Hydrogen Equivalent**—Of a substance is the number of replaceable hydrogen atoms in 1 molecule or the number of atoms of hydrogen with which 1 molecule could react.

**Hydrograph**—A graph showing the stage, flow, velocity, or other property of water, with respect to time.

**Hydrographer**—One who makes surveys, flow measurements, or their analyses of bodies of water; in the U. S. Geological Survey, one who measures the flow of streams.

**Hydrography**—The science of measuring and analyzing the flow of water.

**Hydrology**—That part of geological science which has to do with the relations of water standing or flowing beneath the surface of the earth.

**Hydrolysis**—The interaction of a compound with water as a result of which the compound is broken down into basic or acidic constituents or both. In cement chemistry, this refers principally to the interaction of  $C_3S$  with water, which results in the formation of calcium hydroxide and a less basic calcium silicate hydrate.

—A change in the molecular composition of matter produced by the addition of water.

**Hydrolytic Tank**—A tank in which by biological processes a portion of the suspended matter is converted into liquid and gaseous form.

—In general, any sewage tank in which hydrolysis occurs, specifically applied to a special form of vertical flow tank. General term for any sedimentation tank in

which by bio-chemical processes, a part of the suspended organic matter is liquefied and gasified.

**Hydrometer**—An instrument used for determining the specific gravity of liquids.

**Hydrometry**—The measurement and analysis of the flow of water.

**Hydrophile**—A substance having an affinity for water.

**Hydrophobe**—A substance with a greater affinity for other materials, such as oils, asphalts, or greases, than for water.

**Hydroplane** — (aeronautic) (See plane.)

**Hydrosphere**—The liquid and solid water resting upon and invading the outermost zone of the lithosphere.

**Hydrostatic Catenary**—The curve assumed by a non-extensible, but flexible, cord, when subject to a normal load at all points proportional to the distance below the horizontal line joining its supports; also called the "Elastica."

**Hydrostatic Pressure**—The pressure exerted by a liquid, as water, at rest. (See head, static.)

**Hydrothermal**—In petrology, a term applied to magmatic emanations rich in water; to the processes in which they are concerned.

**Hygrometer**—An instrument used for measuring the amount of moisture in the air.

**Hygroscopic Coefficient**—In ground water technology, the term is used to express quantitatively the capacity of a soil for holding hygroscopic water. It is the percentage of water in soil which, in a dry condition, has been brought into a saturated atmosphere and kept in

that condition at a constant temperature until it has absorbed all the atmospheric water vapor that it is capable of absorbing.

**Hygroscopic Moisture**—In soil technology, that moisture existing in a soil in free air, as distinguished from "free water" that might be in the void spaces expressed as a percentage of the weight of the oven-dried soil.

—Immobile soil moisture that can only be driven off by heat.

**Hygroscopicity**—The ability of soil for readily absorbing and retaining moisture.

**Hypabyssal**—In geology, rocks having become consolidated from fusion, underground, under conditions intermediate between deep-seated and superficial conditions, and therefore differentiated by special structural features; said of certain igneous rocks sometimes called dike-rocks.

**Hypersensitized Film or Plate**—(photography) A film or plate which, after coating with emulsion, is specially treated to increase its speed. The effect of treatment is moderately short-lived, and the film must be kept at moderately low uniform temperature. See, also, Supersensitive Film or Plate.

**Hypersthene**—An orthorhombic pyroxene,  $(\text{Fe}, \text{Mg})\text{SiO}_3$ , and alumina is sometimes present, in which case the composition then approaches the aluminous pyroxenes.

**Hypohyaline**—A partly glassy texture in an igneous rock.

**Hypsometric Map**—General term for map showing relief by any convention, such as contours, hachures, shading, or tinting. See, also, Relief Map.

**I-Beam Girder**—A girder composed of an I-beam.

**Ice**—Frozen water.

—**Age** (geological)—The Pleistocene epoch. (The glacial period.)

—**Apron**—An ice breaker, or starling, placed on the up-stream end of a bridge pier to protect it from the moving ice.

—**Creeper**—A creeper, used for walking on ice.

—**Cutter**—A flanger car equipped between the trucks and beneath the floor with a toothed steel beam, set on edge diagonally across the track between the rails and raised or lowered by means of compressed air, of running rails to loosen hard snow and ice between and just outside.

—**Point and Steam Point**—The ice point is 32 deg. F., and the steam point 212 deg. F., both at saturation pressures corresponding to these two temperatures, respectively.

**Iceland Spar**—Transparent calcite, which, owing to its strong double refraction, is largely used for optical purposes.

**Ichnite**—A fossil footprint.

**Ideal Transducer**—In acoustics, an ideal transducer for connecting two specific systems is a passive transducer which converts the maximum possible power from the first system to the second.

**Identification Light**—A group of lights, clear and colored, carried on the rear part of an airplane for identification at night.

**Idiomorphic**—A descriptive term for those minerals of a rock that have their own crystal faces.

**Ijolite**—A granitoid, nephelite rock, occurring in Finland. It contains chiefly nephelite and pyroxene.

**Ilmenite**—A slightly magnetic iron-

titanium mineral,  $\text{FeTiO}_3$ , containing, when normal, 32 per cent oxygen, 32 per cent titanium, and 36 per cent iron.

**Image Plane**—(photographic mapping) See Photograph Plane.

—**Point**—(photographic mapping) Image on a photograph corresponding to a definite object on the ground.

—**Ray**—(photographic mapping) Straight line from a ground object, through the camera lens, to the image on the photograph.

**Imbibition, Water of**—(See water of imbibition.)

**Imbricate Structure**—In structural geology, a number of parallel reverse faults.

**Imhoff or Emscher Tank**—A 2-story tank consisting of an upper, or sedimentation, chamber, with steeply sloping bottom, terminating in one or more slots through which the solids may slide as deposited into the lower or sludge digestion chamber—these slots being trapped so as to prevent the rise of gas and solids from the lower chamber—the lower chamber being provided with vents for the escape of the gases, the tank being so constructed as to facilitate the passage of the sewage quickly through the upper chamber and prevent the flow of the sewage through the digestion chamber, and so operated that the sludge may be thoroughly decomposed, rendered practically free from offensive odor and so filled with gas that it can be readily drawn off and dried.

**Immelman Turn, Normal**—A maneuver made by completing the first half of a normal loop; from the inverted position at the top of the loop, half-rolling the airplane to

- the level position, thus obtaining a 180 deg. change in direction simultaneously with a gain in altitude.
- Impact**—In physics, the striking together of two masses. When particles or streams of water suffer impact, energy losses result.
- In highway engineering, the force created in a structure or pavement by a vibratory or dropping live load. It is generally assumed as a percentage of the live load. (See **load, impact**.)
- Loss**—In hydraulics, the head lost as a result of the impact of particles of water; included in and hardly distinguishable from eddy loss.
- Mill**—A grinding machine in which the grinding action is caused by rows of loosely hinged hammers striking the material and reducing it by impact.
- Pressure**—The pressure acting at the forward stagnation point of a body, such as a pitot tube, placed in an air current. Impact pressure may be measured from an arbitrary datum pressure.
- Impeller**—A rotating pump vane assembly for forcing liquids or fluids out of a closed housing.
- That which imparts motion or energy to a body.
- Closed**—An impeller having the side walls extended from the outer circumference of the suction opening to the vane tips.
- Double Suction**—An impeller with two suction inlets, one on each side of the impeller.
- Single Suction**—An impeller with one suction inlet.
- Impervious**—Completely resisting the entrance of liquids or gases. Impenetrable.
- That property of a material that prevents percolation.
- Impost**—In architecture, a horizontal member, usually composed of moldings, from which an arch springs.\*
- Impregnation**—Penetration into another material.
- Improved Venturi Flume**—(See **Parshall measuring flume**.)
- Impsonite**—An asphalt found in Oklahoma much like albertite but almost insoluble in turpentine.
- Impulse**—The product of a force and the time during which it acts.
- Inadequacy**—An appraisal term defined as that factor of depreciation representing loss in value resulting from changes in capacity or service requirements, making an article less desirable for use.
- Inch-pound**—A unit of energy or work. The work done in raising a pound vertically through an inch.
- Inch Stress**—A stress distribution on a square inch; the common unit of stress in metals.
- Ton**—A unit of work equal to that involved in raising one ton one inch high.
- Incidence, Angle of**—(aeronautic) (See **angle of wing setting**.)
- Incipient Erosion**—In soil conservation, the early stages of erosion, especially with reference to gully-ing.
- Incise**—In architecture, to cut into, as letters carved into stone. Incisions are usually of V-section.\*
- Incising**—In wood preservation, the puncturing of the lateral surface of resistant wood as an aid in securing penetration by the preservative.
- Incline**—An inclined track or tracks and their supporting structure leading to the adjustable apron or bridge at a transfer slip.
- Inclined Gage**—A staff gage on a slope graduated to read vertical heights above the datum.
- Strut**—A compression member placed in an inclined position.
- Inclinometer**—An instrument that measures the attitude of an aircraft with respect to the horizontal.
- Incongruent**—A compound is said to melt incongruently when at some temperature it dissociates into a

liquid having a different composition and thereby forming a new crystalline phase different in composition from that of the original material.

**Incrustation**—A deposit consisting chiefly of calcium carbonate formed on the surface of concrete by the carbonation of calcium hydroxide dissolved from the concrete. While very unsightly, and evidence of the solvent action of water, a great many structures badly incrustated are still in excellent condition. A term used in studying the durability of concrete.

**Independent Wire Rope** (center)—A complete wire rope placed inside of a wire rope instead of the fiber or wire strand core.

**Index**—Reference marking.

—**Fossil**—A genus or species of fossil which is peculiar to, or characterized in a geological horizon or zone.

—**Of Refraction**—A number which expresses the ratio of the sine of the angle of incidence to the sine of the angle of refraction.

**Indicated Horsepower**—Is the mechanical power developed in the engine cylinder by the steam working against the piston.

**Indicator, Polarity**—(See polarity indicator.)

—**Potential**—(See potential indicator.)

—**Water Tank**—Commonly a strip of wood or metal bearing foot marks and numbers or a dial and needle, used to indicate the depth of water in a tank.

**Indirect Costs**—(See joint costs.)

—**Stress**—A stress induced by another stress.

**Induced Angle of Attack**—The difference between the actual angle of attack and the angle of attack for infinite aspect ratio of an airfoil for the same lift coefficient.

—**Current**—In electricity, that current produced in a conductor by cutting lines of force.

—**Drag**—That part of the drag induced by the lift.

**Induction Compass**—(aeronautic) (See compass, earth-inductor.)

—**System, Rotary**—A carburetor induction system used on radial engines, in which a rotary fan assists in distributing the full charge to the cylinders.

**Indurated**—Hardened; applied to rocks hardened by heat, pressure, or the addition of some ingredient not commonly contained in the rock referred to. Also refers to rocks recrystallized.

—**Rate**—In hydrology, the rate at which water is penetrating the surface of the soil at any given instant; usually expressed in inches per hour.

**Industrial Wastes**—The liquid wastes resulting from the processes employed in industrial establishments.

**Inertia**—The resistance offered by a body to a change of its state of rest or motion.

**Infiltration**—The entrance of ground water into a pipe or conduit either through cracks, joints or perforations.

**Inflation Net**—A rectangular net of cordage, used to restrain the envelope of a kite balloon or non-rigid airship during inflation. Also applied to a free-balloon net designed to be removed after inflation.

—**Sleeve**—(aeronautic) A tubular fabric attachment to an envelope or gas bag, serving as a lead for the inflation tube.

**Inflection Point**—The point where reversal of curvature occurs. Same as point of contraflexure.

**Inflow**—(aeronautic) The flow of air into a propeller.

**Influence Line**—A line which represents the variation of moment, shear, stress, deflection, or similar function at a particular point in the structure, due to a load of unity moving across it.

**Influent**—In sewage practice is a

term which applies to sewage that flows into any sewage treatment device.

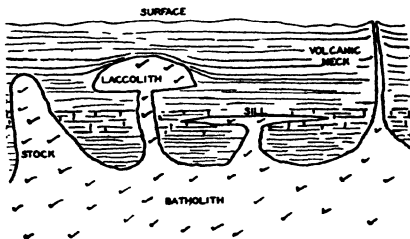
- Stream**—A stream whose upper surface stands higher than the water table in the locality through which it flows, and which is not separated from the water table by any impervious bed.

**Informal Planting**—In roadside development, a type of planting which uses trees and other forms of plant life in the natural grouping and arrangement found in nature.

- Type**—A roadside development term referring to the natural growth of trees and shrubs along the countryside.

**Infra Audible Sound**—In acoustics, sound whose frequency is below the lower pitch limit.

**Ingenious Rocks**—Are those which have been formed or crystallized from magmas, the source of which has been the earth's interior. Examples of this type are granites, syenites, gabbros, etc.



*Diagram of the various forms of igneous rock*

**Ingot**—(metal) A special form of mass metal casting poured direct from the teeming ladle for subsequent rolling or forging.

- Bled**—An ingot which has fallen over while solidifying, or has met with some other mishap, allowing the liquid interior to escape but leaving the walls intact. It may bleed at the top or at the bottom, but usually at the top.

- Butt**—A short ingot, usually the

last one poured from a heat, for which there is not sufficient steel to fill the mold. The lower end of an ingot is sometimes called the butt of the ingot.

- Hot Top or Sink Head**—A type of ingot cast in a mold the top of which is extended with refractory or non-conducting material designed to minimize the piping within the ingot proper.

- Mold**—A flask in which metal is cast into a large block or ingot.

- Stool**—The plate or base on which an open bottom ingot mold stands.

**Inhaul Rope**—A wire rope used on cableways for traveling the carriage toward the operator.

**Inherent Stability**—Stability of an aircraft due solely to the disposition and arrangement of its fixed parts; i. e., that property which causes it, when disturbed, to return to its normal attitude of flight without the use of the controls or the interposition of any mechanical device.

**Initial Set**—The condition of the plastic mixture when it commences perceptibly to "stiffen" or crystallize; term usually applies to time involved between preparation of plastic mixture and stiffening or crystallization of same.

- Vacuum**—In wood preservation, the vacuum sometimes applied as the first step in the treating operation for the purpose of removing air from the wood cells.

**Injector**—A device for feeding water to boilers under pressure.

**Inlay**—To insert or tuck a wire or strand or wind or twist together.

**Inlet**—Upstream opening or intermediate intake of a culvert, drain, sewer, or other conduit. A direct connection between the surface of the ground and a sewer.

- (1) A surface connection to a closed drain; (2) a structure at the diversion end of a conduit; (3) the up-stream end of any

structure through which water may flow.

—**Valve**—A device for admitting air or gas into the cylinder and to prevent its return when being compressed.

**Inlier**—(geology) Outcrops of rocks that are surrounded on all sides by geologically younger rocks.

**Innage**—Applying generally to measurements of bituminous materials in tank cars, and referring to gallonage in dome, or gallonage remaining in tank when car is released. (See outage.)

**Inner Guard Rail**—A longitudinal member, usually a metal rail, secured on top of the ties inside of the track rail, to guide derailed car wheels.

—**Hip**—The intersection of the inner inclined end post of a bridge with the top chord in the arm of the swing span.

**Inorganic**—A designation of matter other than animal or vegetable; hence forming or belonging to the inanimate or mineral world.

**Input Power, Unit of** (symbol bhp.)

—The unit for measuring power shall be the horsepower (550 ft.-lb. per sec.) delivered to the pump shaft and designated as brake horsepower. Equivalents:

1 horsepower=550 ft.-lb. per sec.  
 =33,000 ft.-lb. per min.  
 =2545 btu per hr.  
 =745.7 watts  
 =.7457 kilowatts

**Insert**—A removable device used on construction form ties.

—Any metal device embedded in concrete and exposed at its surface, for future connections.

—Something placed within or between a regular series.

**Inside Caliper**—A caliper for measuring any inside diameter.

**In Situ**—In its natural position or place; said specifically, in geology, of a rock, soil, or fossil, when in

the situation in which it was originally formed or deposited.

**Instability, Spiral**—A type of instability, inherent in certain airplanes, which becomes evident when the airplane assumes too great a bank and sideslips; the bank continues to increase and the radius of the turn to decrease.

**Instantaneous Sound Pressure**—In acoustics, the instantaneous sound pressure at a point is the total instantaneous pressure at that point minus the static pressure. The unit is the dyne per square centimeter.

**Instrument Flying**—The art of controlling an aircraft solely by the use of instruments; sometimes called "blind flying."

**Insulating Brick**—A product manufactured in standard brick shapes used principally for heat insulation purposes.

—**Course** (road)—A uniform compacted layer of stone or slag screenings placed upon the sub-grade prior to base construction for the purpose of "breaking" capillary attraction, and to isolate the base structure from the sub-grade.

—**Fire Brick**—A product with low-heat conductivity suitable for use as a lining for furnaces.

**Insulation**—In railway use, a device or material that prevents the flow of electric current in a track circuit from passing from one rail to the other or through switches and other track structures.

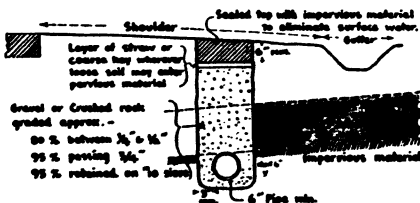
—Material to prevent heat transfer.

—Material which prevents passage of electricity. A non-conductor.

**Intake**—That portion of a pipe or other apparatus through which water enters from the source of supply, such as the end of an intake pipe. A structure built out into a body of water for the purpose of providing a place from which the water may be pumped without interruption.

—An inlet opening.

- The head-works of a conduit; the point of diversion.
- Header**—(aeronautic) A short duct extending from outside the engine cowling to the supercharger intake.
- Pipe Line**—(See pipe line, intake.)
- Intensity of Pressure**—The pressure per unit area.
- Of Radiation**—Is the radiant energy emitted in a specified direction per unit time, per unit area of surface, per unit solid angle.
- Of Rainfall**—In hydrology, the rate at which precipitation is taking place at any given instant, usually expressed in inches per hour.
- Intercepting Channel**—(hydraulics) A channel excavated at the top of earth cuts, or at the foot of slopes, or at other critical places to intercept surface flow; a catch basin.
- Ditch**—An open artificial waterway for preventing surface water from flowing over the slopes of a cut or against the foot of an embankment. Also called diversion ditch.
- Drain**—A subdrain installed along the shoulder of a road to collect ground water flowing toward the road and discharge it where no damage will result. The ditch in which the subdrain is placed is back-filled with porous material.



*Photo courtesy Armco Culvert Mfr's Ass'n  
Intercepting drain (side drain) for  
highways*

- Sewer**—A sewer generally laid transversely to the general sewer system to intercept all the sewage collected by the sewers of a separate system or the dry weather flow of sewage, and such additional storm and surface water as may be determined, from a combined system.
- Interceptor**—(aeronautic) A lateral control device consisting of a small plate placed just back of a wing slot to spoil the effect of the slot at high angles of attack (cf. spoiler).
- Intercolumniation**—In architecture, the space between adjacent columns.\*
- Intercooler**—A device for removing the heat of compression between the stages of compression on compound or multiple stage compressors.
- Interest Cost, Unit**—(See unit interest cost.)
- Interference**—(aeronautic) The aerodynamic influence of two or more bodies on one another.
- Pattern**—In acoustics, an interference pattern is the resulting space distribution of pressure, particle velocity, energy density or energy flux when sound waves of the same frequency are superposed.
- Interior Orientation**—(photographic mapping) The re-establishment of the relation of the plate or film to the camera lens at the time of exposure; its elements are (1) the two rectangular coordinates of the principal point of the photograph with respect to the arbitrary axes of the photograph; and (2) the principal distance of the camera lens. The assumption is made that the optical axis of the lens is perpendicular to the plane of the photograph.
- Interlocking Tile**—Roofing tile having ridges and grooves which interlock when the tile are laid on the roof.
- Intermediate Bent**—Any bent between the end bents of a bridge.
- Longitudinal**—A light longitudinal girder between main longitudinals of a rigid airship, primarily intended for support of the outer cover.
- Posts**—A post between the two outside posts in a timber bent,

- Rocks**—Applies to rocks intermediate in silica content between the basic and the acidic groups.
- Sill**—A horizontal member in the plane of the trestle bent forming the cap of a lower section and the sill of an upper section.
- Transverse**—An open unbraced transverse frame of a rigid airship between two main or braced transverse frames.
- Intermittent Filter**—A natural or artificial bed of sand or other fine-grained material to which sewage is intermittently applied in doses, and which by its capillarity holds the sewage for a time sufficiently long, in the presence of air, to effect by biological processes a high degree of purification.
- Water Treating Plant**—A plant so designed that the water is pumped alternately into two or more treating tanks and there retained until chemical reaction and precipitation are complete.
- Intermontane**—Lying between mountains.
- Internal Friction**—In soil technology, this refers to the resistance of soil particles to sliding over each other.
- Intersection** (street or highway)—The area embraced within the prolongation or connection of the lateral curb lines, or, if none, then the lateral boundary lines of the roadways of two highways which join one another, or the area within which vehicles traveling upon different highways joining at any angle may come in conflict.
- Intersertal**—Sometimes applied to those microscopic textures of igneous rocks which have in the interstices of well-developed minerals, residual masses of glass.
- Interstate**—Between two or more states.
- Intrados**—The inner or concave surface of an arch.
- Intra-Natant Liquor**—Liquid separated from solids occurring as a layer or layers between sludge and scum.
- Intrastate**—Carried on wholly within a state.
- Intratelluric** — (processes) Those processes that take place deep within the earth.
- Intrusion**—In geology, a mass of igneous rock which, while molten, was forced into or between other rocks.
- Intrusive Rocks**—A term applied to those rocks which have been injected into other rocks.
- Inventory**—(noun) Records showing amount of material, supplies and other assets of an enterprise at end of any given period.  
—(verb) The act of counting and recording material, supplies or other property of an enterprise.
- Appraisal**—(See appraisal inventory.)
- Inverse Voltage**—In electricity, the counter electromotive force.
- Invert**—That part of a pipe or sewer below the springing line.  
—The floor, bottom or lowest unit part of the internal cross-section of a conduit.
- Block**—A voussoir-shaped hollow tile built into the invert of a masonry sewer.
- Inverted Flight** (stress analysis)—A loading condition for the wings simulating the conditions of flying upside down and of commencing a dive (cf. dive (stress analysis)).
- Normal Loop**—A loop starting from inverted flight and passing successively through a dive, normal flight, climb, and back to inverted flight.
- Outside Loop**—An outside loop starting from inverted flight and passing successively through a climb, normal flight, dive, and back to inverted flight.
- Siphon**—In hydraulics, a pipe-line crossing over a depression or under a highway, railroad, canal, etc. The term is common but inappro-

- priate as no siphonic action is involved.
- Spin**—A maneuver having the characteristics of a normal spin except that the airplane is in an inverted attitude.
  - Ion**—A charged atom or group of atoms in solution or in a gas. Solutions always contain equivalent numbers of positive and negative ions.
  - Ionic**—The second order of Greek architecture.\*
  - Irish Buggy**—A wheelbarrow.
  - Iron**—A chemical metallic element with crystalline ductile properties obtained from hematite.
  - Berlin**—(See Berlin iron.)
  - Blue-short**—Wrought iron that has been injured and rendered brittle by being worked at a blue heat.
  - Bog**—An iron extracted from ore occurring in marshy ground.
  - Charcoal**—Iron made in a furnace where charcoal is used as a fuel.
  - Chilled**—Iron that is surface-hardened by sudden cooling at the time of casting.
  - Cold-short**—Iron that is weak and brittle when cold, due to the presence of phosphorus.
  - Common**—The poorest quality of commercial iron.
  - Corrugated**—Sheet iron formed with ridges by passing it between fluted rollers.
  - Crystalline**—An iron which when broken shows a crystalline fracture.
  - Forge**—An inferior grade of iron used for puddling.
  - Galvanized**—Iron coated with zinc.
  - Glazed**—An iron containing a large amount of silicon.
  - Gray**—A pig iron in which the carbon takes the form of graphite, giving the fracture a dark color.
  - Ingot**—Soft steel cast in ingots, sometimes with about three per cent of copper added.
  - Jack**—In the Missouri zinc region, solid flint rock with disseminated specks of black jack (zinc blende).
  - Malleable**—Cast iron that has been rendered tough and malleable by long-continued high heating, while embedded in hematite, ferric oxide, etc., and then allowed to cool slowly.
  - Meteoritic**—Iron obtained from meteorites, generally containing about ten per cent of copper.
  - Mirror**—A white, cast metal containing manganese; largely used in the manufacture of steel.
  - Mottled**—An iron in which part of the carbon appears as graphite, giving rise to alternate white and gray spots.
  - Muck**—The lowest grade of wrought iron. Iron ready for the rollers or squeezers.
  - Norway**—A very pure wrought iron manufactured in Norway, used in making hooks for blocks.
  - Pig**—A term applied to cast iron when first run from the blast furnace into molds, giving small-size bars convenient for handling.
  - Refined**—An iron made from muck bars cut up, mixed with scrap iron, reheated, and rolled.
  - Scrap**—Old iron no longer suitable for its original purpose. Waste iron, junk iron.
  - Sheet**—Iron which has been rolled thin into sheets.
  - Swedish**—A very pure wrought iron manufactured in Sweden. Very expensive.
  - Wire**—A ductile iron from which wires are manufactured.
  - Works**—The plant or place where iron structures are fabricated and assembled.
  - Wrought**—In its perfect condition, wrought iron is simply pure iron, but owing to impurities (to a certain degree) being present, it only approximates to that condition.
  - Ironstone**—Any ore of iron from which the metal may be smelted commercially, but usually restricted to stratified ores, especially to

clay-ironstone. It may be a very poor prospect for protore.

**Irregular Weir**—A weir whose crest is not of standard or regular shape.

**Irrigable Area**—The area under an irrigation system capable of being irrigated principally as regards quality and elevation of land. It generally includes roads, farm lots, building sites, and miscellaneous areas not actually irrigated.

**Irrigating Head**—(1) The flow used for irrigation of a particular tract of land; (2) the quantity of water handled by a single irrigator, or that in a single farm lateral.

**Irrigation**—The generic term applied to the process of sewage treatment in which the sewage is applied to cropped land for the primary purpose of purifying the sewage and the secondary purposes of supplying water and fertilizer to crops.

—**Requirement**—The quantity of water exclusive of precipitation, that is required for crop production. It includes economically unavoidable wastes.

—**Water**—The quantity of water artificially applied in the processes of irrigation. It does not include precipitation.

**Irrigator**—One who applies water to land for growing crops.

—**Watering land by means of ditches and lateral channels.**

**Isobars**—The distribution of atmospheric pressure is indicated on a weather map by means of isobaric lines, the lines being of equal pressure.

**Isocenter**—(aerial photographic mapping) The point on a tilted photograph at the intersection of the

principal line and the axis of tilt. (Sometimes called the m-point.) It is approximately midway between the plate nadir and the principal point.

**Isogonic Line**—An imaginary line joining places on the earth's surface at which the variation of the magnetic needle from the meridian or true north is the same.

**Isohaline**—A line connecting points of equal salinity in the waters of the ocean.

**Isohyetal**—Marking equality of rainfall.

**Isostasy**—In geology, the static equilibrium of the blocks of the earth's crust.

**Isotherm**—A line joining points on the earth's surface having the same temperature at a given time or the same mean temperature for a given period.

**Isothermal Compression**—That case of compression where the gas does not change in temperature during compression.

**Isotope**—Elements having the same chemical properties but different atomic weights are called isotopes. Atoms of such elements are supposed to have the same number of satellite electrons, but different numbers of protons in the nucleus.

**Itabarite**—(rock) Rock composed chiefly of micaceous hematite and quartz. A metamorphic rock of schistose structure.

**Itacolumite**—A flexible sandstone which is a peculiar quartz schist found in North Carolina and elsewhere. It is composed of quartz grains, muscovite, talc and a few other minerals.

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Color is usually derived from iron oxides.

—**Jasplite**—(rock) Is the term given to banded rocks consisting of alternating layers of hematite and red chert.

**Jedding Ax**—A kind of stone mason's ax with a flat face and a pointed peen.

**Jenny Winch**—(in marine use) Small stiff leg derrick, usually of wood and operated by hand or small motor. (See jinniwink.)

**Jet**—A hard coal-black variety of lignite, showing the structure of coniferous wood under the microscope. Sometimes used for jewelry; a black marble.

—A small pressure stream of liquid or gas escaping from an orifice.

**Jetting**—In highway construction, this term refers to the forcing of water into holes in the embankment through a 1-inch pipe, having at the end a nozzle with a 1/2-inch opening.  
(piles) To sink piles by means of a water jet.

**Jetty**—An engineering structure at the mouth of a river, or harbor, or elsewhere, to control the water-flow and currents, to maintain depth of channel, to protect harbor or beach.

**Jig**—Any tool or fixture used to guide cutting tools.

**Jinni-wink**—Any short, light, stationary derrick used for raising small loads.

**Joint**—The constructed junction of adjacent sections of a structure.

—In geology, a plane or gently curved crack or fissure, which is one of an approximately parallel set of fissures ranging from a few inches to many feet apart.

—In welding, that portion of a structure wherein separate base metal parts are united.

—**Bar**—A steel member, embodying beam-strength and stiffness in its structural shape and material; commonly used in pairs for the

purpose of joining rail ends together, and holding them accurately, evenly and firmly in position with reference to surface and gage-side alinement.



*Photo courtesy Dr. E. C. E. Lord*

*Joint structure in granite outcrop*

—**Break**—(See break joint.)

—**Butt**—In welding, a generic term applied to a form of joint obtained by the placement of one base metal part on another base metal part, in such a manner that the weld joining the parts is between the surface planes of both of the parts joined.

—**Closed**—In welding, a generic term applied to a joint having its edges or surfaces in contact during welding.

—**Composite**—In welding, a joint wherein welding or some other thermal process of joining metals is used in conjunction with a mechanical process to unite the separate base metal parts.

—**Construction**—(See construction joint.)

—**Contraction**—(See contraction joint.)

—**Corner**—In welding, a generic term applied to a form of joint obtained by the angular placement of an edge of one base metal part on an edge or surface of another base metal part in such manner

that neither part extends beyond the outer surface plane of the other part joined.

- Costs** (indirect costs)—In economics, costs that cannot be directly assigned to a group of similar units, but must be prorated among different groups of units.
- Double Lap**—A lap joint used in the gas and arc welding processes, consisting of three base metal parts, one part being inserted between the two other parts forming two independent lap joints.
- Dummy**—(See dummy joint.)
- Edge**—In welding, a generic term applied to a joint obtained by the placement of a surface of one base metal part on a surface of another base metal part in such a manner that the weld joining the parts is within the outer surface planes of both the parts joined.
- Expansion** (contraction) — (See expansion joint.)
- Fillers, Preformed** — Premolded strips of asphalt cement, mixed with fine mineral substances, fibrous materials, cork, sawdust, etc. They are manufactured in dimensions suitable for insertion in construction joints.
- Flanged Edge**—In fusion welding, an edge joint used in the gas and arc welding processes wherein the abutting end of one of the parts joined is flanged prior to welding.
- Form of**—In welding, joint classification based on the arrangement and cross sectional shape of the component parts of the joint, irrespective of the form or number of welds used to joint said parts.
- Gap**—The distance between the ends of contiguous rails in track, measured at a point  $\frac{5}{8}$  inch below the top of the rail on the outside of the head.
- Insulated Rail**—A railroad rail connection designed to arrest the flow of electric current from rail to rail by means of insulations so placed as to separate the rail ends and other metal parts connecting them.
- Lap**—In welding, a generic term applied to a form of joint obtained by the overlapping of base metal parts, the overlapping surfaces being in the same plane.
- Leaf Edge**—An edge joint used in the gas and arc welding processes wherein the parts are flanged into the same plane on completion of welding.
- Open**—In welding, a generic term applied to a joint having its edges or surfaces spaced apart.
- Plain Butt**—In welding, a butt joint used in the forge welding process wherein the abutting ends of the parts to be welded are upset at approximately 90 deg. with respect to the longitudinal axis of the parts to be joined.
- Rail**—A fastening designed to unite the abutting ends of contiguous rails.
- Single Lap**—A lap joint used in gas and arc welding processes and consisting of two base metal parts.
- Split**—In forge welding, a lap joint used wherein the abutting ends of parts to be welded are tapered, split and interlocked.
- Tee**—In welding, a generic term applied to a form of joint obtained by the angular placement of an edge of one base metal part on a surface of another base metal part in such a manner that this surface extends on both sides of the joint.
- Type of**—In welding, joint classification based on the relative movement and/or deformation of its parts during welding.
- Welded**—A joint wherein separate base metal parts are united by one or more independent welds.
- Joist**—A wood, metal, or concrete beam to which a floor, wall, or ceiling is attached. It is supported by a wall or on girders.
- (See stringer.)
- Jolly Balance**—A very delicate spring balance used especially for the de-

termination of densities by the method of weighing in water and air.

**Joule**—A unit of electrical energy equal to 10,000,000 ergs.

**Judson Powder**—An explosive mixture composed essentially of sodium nitrate blasting powder, the grains of which are coated with nitroglycerin.

**Jump**—(See hydraulic jump.)

**Jumper**—A dolly; a monkey.

**Junction Chamber or Manhole**—A converging section of a sewer used to facilitate the flow from one or more sewers into a main sewer.

**Jurassic**—In geology, the middle one of the three periods comprised in the Mesozoic era. Also the system of strata deposited during that period.

**Jute**—A fibrous, vegetable substance used for caulking.

# K

**Kaolin**—A white non-plastic material, consisting in the raw state, of the mineral kaolinite (pure hydrated silicate of alumina) mingled with fragments of quartz, feldspar, mica, the residual minerals of granite.

**Kaolinization**—The process by which feldspar passes into kaolin.

**Karst Topography**—Topography of the type developed in a region of easily soluble limestone bedrock; characterized by sink holes interspersed with sharp irregular divides, and by a lack of surface drainage lines, much or all of the water finding its escape through caverns and underground streams.

**Keel**—A red iron ochre used for marking lumber.

—The bottom main member of the framework of a ship.

—**Airship**—The assembly of members at the bottom of the hull of a semirigid or rigid airship, which provides special strength to resist hogging and sagging and also serves to distribute the effect of concentrated loads along the hull.

**Keene's Cement**—Anhydrous calcined gypsum, the set of which is accelerated by the addition of other materials.

**KeeWatIn**—According to the U. S. Geological Survey, the overlying but older of the two series of rocks comprised in the Archean system. Also the corresponding geologic epoch.

**Kellogg Truss**—A variation of the Pratt truss.

**Kepler's Laws**—(1) The planets move about the sun in ellipses, at one focus of which the sun is situated. (2) The radiu vector joining each planet with the sun describes equal areas in equal times. (3) The cubes of the mean dis-

tances of the planets from the sun are proportional to the squares of their times of revolution about the sun.

**Kerf**—The narrow slot made in sawing timber.

**Kettle**—A vessel or tank for heating bituminous material, usually of 3 to 10 barrel capacity.

—**Hole**—A steep-sided hollow, without surface drainage, especially in a deposit of glacial drift.

**Keweenawan**—The uppermost or youngest of the series of rocks comprised in the Algonkian system.

**Key**—A projection or depression designed to prevent movement of adjoining parts.

—**Blocks**—The first blocks which are removed in opening up a new quarry floor.

**Keystone**—The center stone at the crown of an arch.

**Kick-back**—In wood preservation, the amount of preservatives forced out of the cylinder when the pressure is released.

**Kidney Ore**—A variety of hematite, occurring in compact kidney-shaped masses.

**Kies**—A general term for the sulphide ores.

**Kieselguhr**—German name for diatomaceous earth, and more or less current in English.

**Kill**—To hold molten steel in a ladle, furnace, or crucible until the edulition of gas ceases and the metal becomes quiet.

**Kiln**—A furnace of brick or stone or a heating chamber for the purpose of hardening or heating to high temperature or burning or drying anything. Used in the seasoning of lumber and in the manufacture of such materials as cement, brick, tile, lime.

—**Chamber**—(See chamber kiln.)

**Kiln-dried**—That dried material from which the moisture has been removed in kilns by means of hot air.

**Kiloampere**—In electricity, a unit of current, or 1,000 amperes.

**Kilogram**—A thousand grams, or 2.2046 pounds.

**Kilometer**—A length of one thousand meters, equal to 3,280.8 feet, or 0.621 mile.

**Kilowatt**—A standard unit of electric energy equal to 1,000 watts.

**Kilowatt-Hour Consumption**—Per 1,000 gallons for a water pump:  
Kw.-Hr. per 1,000 gallons=

$\frac{\text{Head in Ft.} \times .314}{\text{Overall Efficiency}}$

(Expressed in per cent and not as a decimal.)

**Kinetic Energy**—Energy due to motion.

—In hydraulics, the energy of flowing water due solely to its motion. It is proportional to the product of flow and velocity head.

**King Post**—The middle post standing at the apex of a King post truss.

**Kink**—A short, sharp, severe bend in a wire rope which is very injurious to the rope.

**Kinzigite**—A metamorphic rock consisting chiefly of biotite, garnet and oligoclase.

**Kip**—A stress unit equal to 1,000 pounds.

**Kite Balloon**—An elongated form of captive balloon, fitted with lobes to keep it headed into the wind; it usually derives increased lift from the inclination of its axis to the wind.

**Knapping**—The act of breaking stone with hammers or sledges.

**Knee Brace**—A short diagonal brace,

used to connect a batter brace or a vertical post in a span to an overhead strut.

**Knee-Braced Trestle**—A trestle provided with knee braces.

**Knot**—In the case of wood, that portion of a branch which has become incorporated in the body of a tree. A large knot is one over 1½ inches in diameter. A medium knot is over ¾ inch but not over 1½ inches in diameter. Pin knots have diameters less than ½ inch. Small knots vary between ½ inch and ¾ inch in diameter.

**Knots**—A term applied by quarrymen to dark-gray or black objects more or less oval or circular in cross-section, which are segregations of black mica or hornblende formed in the granite while in a molten state.

**Knox Hole**—A circular drill hole with two opposite vertical grooves which direct the explosive power of the blast.

**Koch Tool**—A combination shovel and hazel hoe with demountable handle.

**Kutter's Formula**—In hydraulics, an empirical formula expressing the value of the coefficient, C, in the Chezy formula, in terms of the friction slope, hydraulic radius, and a coefficient of roughness.

**Kyanite**—An aluminum silicate, having a bluish center in the crystals.

**Kyanize**—In wood preservation, treating wood by steeping in a solution of mercuric chloride.

**Kyrolock**—Similar to Bituroc described herein. It is quarried from a natural silica bitumized sandstone deposit in Kentucky. As in other asphalt construction repairs, the surface of an old base is painted with a liquid bitumen prior to placing rock asphalts.

# L

**Labor**—There are some variations in the judicial definition of manual labor. In its ordinary and usual meaning and acceptance, it has been held to be: "Labor performed by and with the hands or hand, and it implies the ability for such sustained exercises and use of the hands or hand at labor as will enable a person thereby to earn or assist in earning a livelihood."

**Labradorite**—A lime-soda feldspar.

**Laced Strut**—A strut that has lacing of small bars running diagonally on the open face or faces.

**Lacing**—A system of bars used to connect two parallel parts of a metal member in order to make them act as a single member.

**Lacustrine Deposits**—Deposits formed in the bottom of lakes.

**Ladder Dredge**—A dredge having buckets carried on a ladder chain.

**Ladle**—A large vessel or pot for holding, transporting, and pouring molten metal.

—**Barrow**—A special wheelbarrow for carrying a ladle of molten metal.

—**Crane**—(See crane ladle.)

—**Test Ingot**—A small casting made when metal is teemed, to be used for chemical test purposes.

**Lag Screw**—A thick screw with a square bolt head.

**Lagging**—Strips used to carry and distribute the weight of an arch to the ribs or centering during its construction.

**Lagoon**—A marsh, shallow pond, or lake, especially one into which the sea flows.

**Laid**—Closed or twisted together, as the strands are laid in a rope.

**Laid-up**—A term used in riveting to denote that the dolly bar is tight against the head of the rivet preparatory to driving.

**Laitance** (of Portland cement concrete)—An accumulation of the finer materials of the cement and aggregate which is brought to the top of a concrete mass by the use of excessively wet mixtures, and forms a light chalky crust after hardening.

**Lake Asphalt**—Native asphalt occurring as surface deposits in natural depressions of the earth's crust. Examples are Trinidad and Bermudez asphalts.

**Lamberts**—(See brightness.)

**Lambert's Law**—When light is normally incident on a perfectly diffusing surface the intensity of the reflected light is proportional to the cosine of the angle made with the normal.

**Lamella**—A thin scale, or plate.

**Lamellar**—Composed of thin layers, plates, scales, or lamellae.

**Lamina**—A thin sheet.

**Laminar Flow**—A particular type of streamline flow. The term is usually applied to the flow of viscous liquid near solid boundaries, when the flow is not turbulent.

**Laminations**—Refer to the banding in rocks caused by variations in color of different minerals. These laminations are distinguished frequently by the amount of oxidation of the iron present. Quite often these laminations result in the rock breaking easily along the laminated portion.

**Lamphole**—A small vertical pipe or shaft leading from the surface of the ground to the sewer, for admitting a lantern or reflected light for purposes of inspection.

**Lamprophyre**—A general term given to dike rocks of porphyritic texture, whose predominant phenocrysts are the dark silicates, augite, hornblende or biotite. They are

essentially dikes of basic magma.

**Land Forms** (erosion)—In soil conservation, land forms, or physical features of the land surface, developed by the processes of erosion, as gullies and larger valleys, residual upland divides, glacial troughs, wave-cut cliffs, and wind blow-outs.

—**Report**—In railway usage, a statement compiled and published by the Interstate Commerce Commission, showing a detail of the land and non-carrier improvements owned by a railway and purporting to show the value as of a stated date, indicating the property used for transportation purposes and otherwise.

**Landing**—The act of terminating flight in which the aircraft is made to descend, lose flying speed, establish contact with the ground, and finally come to rest.

—**Angle**—The acute angle between the wing chord and the horizontal when the airplane is resting on level ground in its normal position; also called "ground angle."

—**Area, Effective**—That portion of the landing area, with approaches clear within the allowable safe climbing and gliding angle, available for the take-off and landing of aircraft.

—**Beam**—A beam projected from the field to indicate to the pilot his height above the ground and the position of the airplane on the proper path for a glide landing.

—**Field**—Any area of land designed for the take-off and landing of aircraft. It may or may not be part of an airport.

—**Gear**—The understructure which supports the weight of an aircraft when in contact with the land or water and which usually contains a mechanism for reducing the shock of landing. Also called "undercarriage."

—**Light**—A light carried by an air-

craft to illuminate the ground while landing.

—**Speed**—The minimum speed of an airplane at the instant of contact with the landing area in a normal landing.

—**Strip**—A narrow and comparatively long area forming part of a land-plane airport or of an intermediate or auxiliary field, which is suitable for the landing and take-off of airplanes under ordinary weather conditions.

—**Wire**—A wire or cable which braces the wing against the forces opposite to the normal direction of the lift.

**Landing-Direction Light**—A light designed to indicate, either by itself or in conjunction with other lights, the direction in which landings are to be made.

**Landplane**—An airplane designed to rise from and alight on the land.

**Landmark Beacon**—A beacon light, other than an airport beacon or an airway beacon, that serves to indicate a definite geographical location.

**Landplaster**—(See gypsum.)

**Landscape**—A portion of land comprehended in one view with especial attention to its pictorial aspect; as distinguished from a sea picture or view.

—**Architect**—One who is qualified by technical training and experience to practice the profession of landscape architecture.

—**Architecture**—The art which has as its object the forming, shaping, and arrangement of land surfaces for human use and enjoyment; the design and laying out of land areas.

—**Development**—(of highways) The application of the principles of landscape architecture to highway design, construction and maintenance.

—**Engineer**—One who is qualified by technical training and experience

- in the practice of landscape architecture to carry out landscape development of highways, parks, parkways or other public or private areas, of large size and extensive character.
- Forester**—One who is qualified by technical training and experience in the practice of city or park forestry, as distinguished from the growing of timber crops.
- Grading**—Commonly used to denote the special "stream lining" or rounding now recommended by landscape and highway engineers for highway slopes, shoulders, and ditch areas.
- Lang Lay**—A wire rope in which both the wires in the strands and the strands themselves are twisted in the same direction.
- Lap**—That part of a surface which extends over an adjacent surface.
- To place one piece upon another such that the sides are even but one end reaches beyond the other.
- Riveting**—The making of a lap-joint by using rivets to fasten the overlapping ends of the plates.
- Splice**—A joint made by placing one end of a member on top of the end of another member and fastening them together with pins, nails, screws, bolts, rivets, or similar contrivances.
- Lapweld**—To weld by overlapping the joints.
- Lapilli**—Volcanic dust and small fragments of lava ejected from volcanoes.
- Lassenite**—Unaltered, glassy trachytes. The name comes from Lassen's Peak, Cal.
- Latent Heat**—Heat that is absorbed or given off by a substance when changing its state from solid to liquid or gas, or vice versa, without changing its temperature. It is important in air conditioning as the heat required to evaporate water for humidification purposes and the heat released by water vapor when condensed in the dehumidifying process.
- Lateral**—(hydraulics) A conduit diverting water from a main conduit, for delivery to distributaries; a secondary ditch.
- (Bridges) A horizontal tie beam or brace.
- At right angles to the line of motion; sideways.
- Axis**—(aeronautic) (See axes of an airplane.)
- Flow Spillway**—A spillway in which the initial and final flow are approximately at right angles to each other; a side-channel spillway.
- Resistance Derivatives**—(aeronautic) Resistance derivatives expressing the variation of moments and forces due to small changes in the lateral, yawing, and rolling velocities.
- Sewer**—A sewer which does not receive the sewage from any other common sewer.
- A sewer which discharges into a branch or other sewer and has no other common sewer tributary to it.
- Lateral Stability**—(aeronautic) Stability with reference to disturbances about the longitudinal axis; i. e., disturbances involving rolling or sideslipping. The term lateral stability is sometimes used to include both directional and lateral stability, since these cannot be entirely separated in flight.
- Strut**—A strut in the lateral system of a bridge.
- System** (bridges)—A system of tension and compression members, forming the web of a horizontal truss, connecting the opposite chords of a span. Its purposes are to transmit wind pressure to the piers or abutments, to prevent undue vibration from passing trains or other loads, and to hold the chord members to place and line.
- Laterite**—A name derived from the Latin word for brick earth, and applied to the red, residual soils,

- or surface products that have originated in situ from the atmospheric weathering of rocks. Especially found in the tropics.
- Lath**—A material whose primary function is that of a base or background for the reception of plaster or stucco.
- Latite**—Rocks that are intermediate among the trachytes, andesites and basalts. Plagioclase and orthoclase are both present; augite, hornblende, biotite and olivine vary in amounts.
- Latitude**—Distance on the earth's surface from the equator, measured in degrees of the meridian.
- Astronomic**—The angle between the direction of gravity and the plane of the equator.
- Difference**—Length of the projection of a traverse course on to a meridian (length of course times cosine of bearing). Also called "Latitude," "Northing," or "South-ing."
- Geocentric**—The angle between the radius vector, or line, from the place to the center of the earth, and the plane of the equator. (Latitude as shown on topographic maps and on navigators' charts is Geodetic Latitude.)
- Geodetic**—The angle between the normal to the spheroid and the plane of the equator.
- Latticing**—A system of bars crossing each other at mid-length, used to connect the two leaves of a strut in order to make them act as one member. Generally the crossed bars are riveted together at their intersection.
- Lava**—A general name for the magma outpourings of volcanoes. It is applied only to the material that has reached the surface and cooled into rock.
- Latvite**—In electricity, an insulating material.
- Law, Brewster's**—(See Brewster's law.)
- Henry's**—(See Henry's law.)
- Hooke's**—(See Hooke's law.)
- Kepler's**—(See Kepler's laws.)
- Lambert's**—(See Lambert's law.)
- Of Combining Volumes, Gay-Lussac's**—(See Gay-Lussac's law of combining volumes.)
- Of Definite Proportions**—In chemistry, in every sample of each compound substance the proportions by weight of the constituent elements are always the same.
- Of Mass Action**—At a constant temperature the product of the active masses on one side of a chemical equation when divided by the product of the active masses on the other side of a chemical equation is a constant, regardless of the amounts of each substance present at the beginning of the action.
- Of Motion, Newton's**—(See Newton's laws of motion.)
- Of Multiple Proportions**—Two elements may combine in more than one proportion by weight, but if so, the weights of one element which combine with a fixed weight of the other element, are always in a simple ratio to each other.
- Pascal's**—(See Pascal's law.)
- Lay**—The pitch or angle of the strands laid into a rope.
- Layer**—In welding, a stratum of weld metal of a fusion weld and consisting of one or more beads depending on the dimensions of the weld and the welding technic employed.
- A course made in one application.
- Layer-Out**—The person in a bridge shop who places the templates on steel plates to mark for cutting.
- Layout**—A plan or arrangement of the parts of a structure shown on a drawing.
- Lazurite**—A bluish isometric mineral containing sodium, silica, alumina, and sulphur.
- Leach**—To dissolve out by percolation. Refers particularly to the removal of soluble preservatives from

- wood in contact with wet soil or water.
- In geology, to dissolve minerals or metals out of the ore, as by the use of cyanide or chlorine solutions, acids, or water.
  - To remove alkali from soils by abundant irrigation coupled with drainage.
- Leaching Cesspool**—A cesspool out of which the liquid leaches into the surrounding soil.
- Lead**—(actual) In railway use, the length between the actual point of the switch and the half-inch point of the frog measured on the line of the parent track.
- (theoretical) In railroad use, the distance from the theoretical point of a uniform turnout curve to the theoretical point of the frog, measured on the line of the parent track.
  - Curve**—In railway use, the curve in the turnout interposed between the heel of the switch and the frog.
  - Sheathing**—The protective covering of an electric cable.
- Leading Edge**—The foremost edge of an airfoil or propeller blade.
- Leads**—The upright parallel members of a pile driver which support the sheaves used to hoist the hammer and piles, and which guide the hammer in its movement. Pronounced Leads.
- Leaf** (of a member)—One of the vertical component parts of a built-up member; consisting generally of one or more web plates with top and bottom angles, or one rolled channel. Usually two in number and sometimes three.
- Leakage**—Passage of water, fluid or gas contrary to intention.
- Least-work**—A method of determining stresses in the members of a redundant system.
- Ledge**—(rock) Several beds of rock occurring in a quarry. However, it may also be applied to a single bed of rock.
- Ledger Account**—An account of an individual piece of work or class of expense kept in ledger form.
- Value**—In railroad use, the value at which the property is carried in the Property Investment Account of the carrier.
- Left Bank**—That bank of a stream which is on the left when one looks in the direction in which the stream flows.
- Lay**—A wire rope whose strands are laid like a left-hand screw thread.
- Left-Hand Engine**—An engine whose propeller shaft, to an observer facing the propeller from the engine end of the shaft, rotates in a counter-clockwise direction.
- Leg**—In welding, one of the fusion surfaces of a fillet weld.
- Length**—(pipe) A section or fabricated unit.  
(general) Distance between two points measured along a line. Extension from end to end.
- Chord**—(aeronautic) (See chord length.)
  - Gage**—The original length marked on a test bar for the determination of the elongation.
  - Panel**—The distance between two adjacent panel points in the same chord of a truss or span.
- Length-of-Run**—The distance water must run in furrows or over the surface of a field from one head ditch to another, or to the end of a field.
- Lens, Bertrand**—(See Bertrand lens.)
- Lenticular**—Lens-shaped.
- Leopardite**—A siliceous rock from North Carolina, mottled with stains of manganese oxide.
- Lepidolite**—A light-colored lithium-bearing mica. Contains about 4 to 6 per cent lithia.
- Leucite**—An aluminum and potassium mineral,  $\text{KAl}(\text{SiO}_3)_2$ , containing 55 per cent silica, 24 per cent alumina, and 21 per cent potash.

- Levee**—An embankment or wall to prevent inundation.
- Back of**—Side away from the river, facing the protected area. Sometimes called the land side or inside of levee.
  - Core Wall**—A center wall of selected, impervious material placed in a levee. Used when material within reasonable distance is unsuitable for entire levee.
  - Crown**—Top of levee; is level at right angles to levee center line.
  - Front of**—Side next to the river, facing away from the protected area; sometimes called the outside.
  - Grade**—The slope of the crown of levee along the center line.
  - Line of Saturation**—Line across a levee up to which water will theoretically saturate the material. This line slopes down from the water line of river on angle of about 12 degrees to the horizontal in a levee well constructed of good average material.
  - Muck Ditch**—A ditch 4 to 6 feet wide and 6 feet or more deep, excavated in natural soil along the center line of crown of levee to explore foundation conditions where character of material is not fully known or where there is a possibility that water will move between natural surface and bottom of levee. It is backfilled with puddled or tamped impervious material.
  - Overtopping**—Applied to a condition when the water reaches a height above the elevation of crown of levee.
  - Sand Boil**—Ebullition of water behind a levee.
  - Section**—Cross-section of levee, perpendicular to center line.
  - Slope**—Slope or inclination of sides of levees downward from crown. Generally these slopes are 1 to 3, but occasionally are flatter where less suitable materials are available.
- Level**—In railway use, the condition of the track in which the elevation of the rails transversely is equal.
- In surveying, an instrument for measuring differences in elevation between two widely separated points.
  - Dumpy**—An engineer's level having a short telescope rigidly fixed to the supporting bar and vertical axis.
  - Engineer's**—A leveling instrument consisting of a telescope, having cross hairs, mounted on a supporting frame which can be brought to a level by means of screws, and which can be rotated about a vertical axis. A tripod serves to hold the instrument at a convenient height for the observer.
  - Landing** (stress analysis)—A loading condition for the fuselage and landing gear, representing a two-point landing with the fuselage horizontal.
  - Rod**—A graduated rod, in feet, tenths, and hundredths, used in measuring the distance between points on the ground and the line of sight of a leveling instrument.
  - Velocity**—(See velocity level.)
- Leveler**—In stone masonry work, a small rectangular stone, not less than 4 to 6 inches thick, used in broken range work to complete the bed for a stone in the course above and give it proper bond.
- A buck scraper, drag, or any other form of device for smoothing land for irrigation.
- Leveling Course**—A course placed for the purpose of shaping old surfaces to the proper cross section to receive a subsequent surface course.
- Differential**—(See differential leveling.)
  - Profile**—(See profile leveling.)
- Level-Off**—To make the flight path of an airplane horizontal after a climb, glide, or dive.
- Levels, Flying**—(See flying levels.)

**Lever Draw Bridge**—A draw bridge operated by means of a lever.

**Lewis**—A four-piece steel instrument used in lifting stone. (The lewis engages the stone by means of a triangular-shaped hole into which it is keyed.)

—**Hole**—An opening made by drilling two or three holes near together and chiseling out the intervening rock.

**Life**—(average) An appraisal term defined as the mean or normally expected duration of a property.

—(economic) An appraisal term defined as the estimated period over which it is anticipated that a property may be profitably utilized.

—(physical) An appraisal term defined as the estimated period over which it is anticipated that a property may retain its capability of functioning, if unlimited by economic or non-physical causes; the period over which it would function if limited only by actual deterioration of materials or parts of which it is composed.

—(weighted) —An appraisal term defined as the mean expected duration averaged on the basis of the unit cost or value of composite properties or units of dissimilar kind.

**Lift**—The plane approximately parallel to the floor of a quarry, along which the stone is usually split in quarrying.

—**Bridge**—(See bridge, lift.)

—**Direction** (stress analysis)—(aeronautic) The direction in the plane of symmetry perpendicular to the relative wind (cf. beam, chord, drag, and side directions).

—**Force, or Component** (stress analysis)—(aeronautic) A force, or component, in the lift direction (cf. beam, chord, drag, and side forces).

—**Wire**—(aeronautic) A wire or cable which braces the wings against the lift force; sometimes called "flying wire."

**Lift/Drag Ratio**—(aeronautic) The ratio of the lift to the drag of any body.

—**Suction, Dynamic**—(See dynamic suction lift.)

**Light, Polarized**—Light in which the vibrations are in one plane.

**Lighter**—A barge usually decked over, either open or roofed, used to convey cargo to and from vessels within a port.

**Lighting Unit**—In highway lighting, a unit consisting of the assembly of pole or post with bracket and luminaire.

**Lightning Arrester**—An apparatus for protecting electric circuits from lightning.

**Limburgite**—A porphyritic, basaltic rock consisting chiefly of olivine and augite in a glassy ground-mass. It lacks feldspar.



*Ocala limestone deposit in Florida*

**Lime** — (See air, fine, granular, ground, hydrated, lump, pebble, pulverized, run-of-kiln, selected, or waste lime.)

—**Rock**—A natural material found chiefly in Florida and Georgia. It is composed essentially of calcium carbonate with varying percentages of silica. Lime rock hardens upon exposure to the elements and some varieties provide excellent road metal.

—**Water**—(See water lime.)

**Limestone**—Any natural rock of sedimentary origin composed prin-

- cipally of calcium carbonate or of calcium and magnesium carbonates in either its original chemical or fragmental, or recrystallized form.
- Cavern**—(See cavern limestone.)
  - Dolomitic**—(See dolomitic limestone.)
  - Hydraulic**—(See hydraulic limestone.)
  - Oolitic**—(See oolitic limestone.)
  - Limey Slag**—A slag of such unusual chemical composition that it disintegrates to dust immediately upon cooling and exposure to the air—such action ceasing when the material has reached atmospheric temperature.
  - Limit Load**—The greatest load which a structure is permitted to carry as set forth in the specifications. A safety load.
  - Limonite**—A hydrous oxide of iron; a hydrated hematite, which when scratched or powdered, gives a brownish rust color. When pure it contains 85.6 per cent of iron and 14.4 per cent of water.
  - Line**—In railway use, the condition of the track in regard to uniformity in direction over short distances on tangents, or uniformity in variation in direction over short distances on curves.
  - Base**—A line adopted as a fundamental line in a survey from which other lines are run. Used in triangulation work.
  - Center**—A line connecting the mid-points of anything.
  - Closing**—The last line or side of a polygon, drawn or surveyed, which encloses the area.
  - A rope which actuates the shutting mechanism of a clamshell or orange peel bucket.
  - Contour**—A line joining points having or representing equal elevations.
  - Datum**—A line of reference.
  - Drop**—In electricity, the reduction in voltage due to losses in the line between the source and its load.
  - Fall**—A rope or steel cable used with pulley-blocks in hoisting.
  - Manhole**—A manhole in the line of a sewer at a point where no other sewers connect. It may be at a point where the sewer changes direction, either in line, slope, or grade.
  - Map**—(See Planimetric Map.)
  - Of Saturation**—Line across a levee up to which water will theoretically saturate the material. This line slopes down from water line on an angle of about 12 degrees in a well-constructed fill or levee of good average material.
  - Of Sight**—The sighting or pointing line of a telescope, defined by the optical center of the objective and the intersection of the crosshairs. See, also, Collimation Position.
  - Post**—A fence post placed between end or corner posts.
  - Lineal Shrinkage**—In soil technology, for a given moisture content is the decrease in one dimension, expressed as a percentage of the original dimension, suffered by the soil mass when the moisture content is reduced from an amount equal to the field moisture equivalent to the shrinkage limit.
  - Linear**—Relating to length only.
  - Foot**—A running foot.
  - Lines of Force**—In electricity, a term commonly applied to the strength of a magnetic or electro-magnetic circuit.
  - Lining**—A substance or coating placed on an interior surface, or a substance or coating placed on the surface of a waterway to prevent leakage, erosion, corrosion, or tuberculation.
  - A protective covering over all or over a portion of the perimeter of a canal, or reservoir, to prevent seepage losses, to withstand pressure, or resist erosion.
  - Basic**—(See basic lining.)
  - Track**—Shifting the track laterally to conform to the established alinement.

- Link**—One of the links of a surveyor's chain and equal to 7.92 inches.
- Lintel**—A horizontal structural member spanning an opening, and supporting a weight.\*
- Linville Truss**—Same as "Whipple truss."
- Lip**—Part of a dam; small wall on downstream end of apron, to break the flow from apron.
- Curb**—The raised portion, usually about six inches wide and three or four inches high, of triangular section along the outside edge of concrete highway paving slabs.
- Liquid Asphaltic Road Materials**—Asphaltic products which are so soft that their consistency cannot be measured at normal temperature by means of the penetration test. They are classified under three groups, rapid curing, medium curing, and slow curing.
- Limit**—In soil technology, that moisture content, expressed as a percentage of the weight of the oven-dried soil, at which the soil will just begin to flow when lightly jarred ten times.
- Thermostat**—One operated by the expansion or contraction of a liquid.
- Liquefier**—A specific term applied to a petroleum naphtha having specified characteristics. It is used in cold-mix cold-laid bituminous compositions to soften the bituminous binding medium during the period of manipulation.
- Liquidus Curve**—A curve indicating the continuous change in temperature with composition at which the primary phase first crystallizes from a melt.
- Listed Securities**—Listed securities are those which have been admitted for listing by the Governing Committee of a stock exchange.
- Liter**—A measure of capacity in the metric system, and equal to 61.022 cubic inches, or 0.908 U. S. quarts dry, or 1.0567 wet.
- Lithographic Stone**—A fine-grained homogeneous limestone suitable for etching. (See Solenhofen stone.)
- Lithology**—(See petrology.)
- Lithophysae**—Meaning "stone bubbles." A name given to those cellular cavities in acidic lavas, obsidian, rhyolite, etc., that have concentric walls. They are caused by a special development of mineralizers at that particular point.
- Lithosphere**—That part of the earth which is composed predominantly of rocks, including the products of rock-disintegration and other incoherent materials, together with everything within the rocky crust.
- Litter**—Accumulation of leaves, fruits, twigs, branches, and other plant parts on the surface of the soil covered by vegetation.
- Littoral**—Of or pertaining to a shore. A coastal region.
- Load**—The weight carried by a beam, girder, truss, span, or structure of any sort, or any part of such structure, including its own weight.
- Apex**—The load at a panel point of a truss.
- Breaking**—A load which when placed upon a structure or test piece would just be great enough to break it.
- Concentrated**—A load that is concentrated at a point or distributed over a very small area.
- Dead**—The weight of all parts of a bridge itself and anything that may remain upon it for any length of time, such as tracks, water mains, telephone and telegraph lines, snow, dirt, moisture, etc.
- The fixed weight of a structure.
- Factor**—(of compressors) The ratio of the average compressor load during a certain period of time to the maximum rated load of the machine.
- In electricity, the relation of average load to the maximum load.
- (stress analysis)—(aeronautic) The ratio of two loads (the second being a basic load) that have the

same relative distribution. The first load may be the load applied during some special maneuver, the maximum probable load on the airplane or part, the design load, or the ultimate load. Whenever a load factor is mentioned, the context should indicate clearly what load is being compared with the basic load. If the context does not so indicate, the load factor is usually the ratio of the design load to the weight of the airplane.

**Load, Impact**—A percentage of the live load added to compensate for the additional stress on a structure caused by the striking force, in any form, of a moving load.

—**Live**—A moving or variable load which a structure is designed to support in addition to its own dead load.

—**Peak**—(See peak load.)

—**Proof**—The greatest load that can be applied to a member without producing permanent distortion.

—**Safe**—Any load which does not produce stresses, in the members, having a higher intensity than those allowed in the specifications.

—**Test**—A live load applied to any finished construction as an ocular proof of its safety. It is of no real value.

—**Transferred**—A load which has been carried over from another part of the structure to the member in question.

—**Uniform**—A load which is evenly distributed, or the same per lineal foot of span.

—**Wind**—A load on a structure due to the pressure of the wind.

—**Working**—A safe load established by the specifications.

**Loading Line**—A wire rope used in logging for loading the logs.

**Loam**—A loam is a soil having a relatively even mixture of the different grades of sand and of silt and clay. It is mellow with a somewhat gritty feel, yet fairly smooth and slightly plastic.

Squeezed when dry, it will form a cast that will bear careful handling, while the cast formed by squeezing the moist soil can be handled freely without breaking. Some loamy soils contain a considerable proportion of organic matter.

**Loamy Topsoil**—A mixture of sand, silt and clay particles with varying percentages of organic material, which exhibits sandy and clayey properties in approximately equal proportions.

**Lobby**—An area in a passenger station around which ticket windows, parcel and baggage checking windows, information booths and other facilities may be placed.

**Local Metamorphism**—Contact metamorphism as distinguished from regional metamorphism.

**Location**—The center line and grade line of a roadway established preparatory to its future construction.

—The center line and grade line of an engineering structure or railway established, preparatory to its construction.

**Lock**—In stone masonry work, any special device or method of construction used to secure a bond in the work.

—**Band**—A course of bond stones in masonry construction.

—**Sill**—(See clap sill.)

**Locus**—In mathematics, a curve considered as generated by a moving point, or a surface considered as generated by a moving line; the partly indeterminate position of a point subject to an equation or to two equations in analytic geometry; a curve considered as generated by its moving tangent or by a moving curve of which it is the envelope.

**Lodestone**—A piece of magnetite possessing polarity like a magnetic needle.

**Loess**—Is wind blown silt or silty clay having little or no stratification. Some of its peculiarities are

the light color, fine state of subdivision, the sharpness and angularity of its particles, its porosity and coherence.



*Photo courtesy U. S. Bureau of Public Roads  
Loess soil passing the No. 20 sieve,  
retained on the No. 40 sieve. X20*

**Log**—In geology, the detailed record of the rocks passed through in drilling.

—An abbreviation for "logarithm."

—**Chute (Log-Way)**—A bypass around or through a dam for logs and drift.

**Logarithm**—The exponent of the power to which a fixed number, called the base, must be raised in order to produce a given number.

—**Common**—A system of logarithms in which the base is ten.

—**Natural**—A system of logarithms in which the base is 2.71828+.

**Loggia**—In architecture, an enclosure or gallery of a building open on one side, the open side being carried by a colonnade or arcade.\*

**Lomas Nut**—A nut having a recess on the bottom which permits it to be screwed down on the pin until the edges of the nut bear on the eye-bars packed on the said pin.

**Long Chord**—See Chord.

—**Period Forces**—The tide-producing

forces having a period of one-half month, or more.

—**Ton**—A ton of 2,240 pounds.

**Longeron**—A principal longitudinal member of the framing of an airplane fuselage or nacelle, usually continuous across a number of points of support.

**Longitude, Astronomic**—The angle between the meridian plane containing (or parallel to) the plumb line at the station and the zero, or reference, meridian (usually that of Greenwich).

—**Difference**—(See Departure.)

—**Geodetic**—The angle between the meridian containing the "normal" at the station and the zero, or reference, meridian.

**Longitudinal Float**—Float with handle on each end and operated parallel with the center line of the pavement. A power-operated machine, sometimes called a "bull float," has replaced the hand-operated float.

—**Girder**—A main girder in a structure running parallel to the center line thereof.

—**Resistance Derivatives**—(aeronautic) Resistance derivatives expressing the variation of moments and forces due to small changes in the longitudinal, normal, and pitching velocities.

—**Shear**—A shear parallel to the long axis of a body.

—**Stability** — (aeronautic) Stability with reference to disturbances in the plane of symmetry; i. e., disturbances involving pitching and variation of the longitudinal and normal velocities.

—**Strut or Girt**—A stiffening member running horizontally, or nearly so, from bent to bent.

—**X Brace**—A member extending diagonally from bent to bent in vertical or battered plane.

**Loop**—A large eye of any size formed in the end of a rope.

—(aeronautic) A maneuver executed in such a manner that the airplane

follows a closed curve approximately in a vertical plane.

—**Ground**—(aeronautic) (See ground loop.)

—**Radio**—A specified number of turns of wire located in the wings or wound around the fuselage of an airplane. Small portable loops on a rectangular frame are also used.

—**Safety**—A loop formed in a rip cord of an aerostat and attached to a securing patch by a breakable cord or a spring clip.

—**Sandbag**—A system of cordage loops on the envelope of a balloon for suspending sandbags.

**Loose Rock Dam**—A dam built of rock without the use of mortar.

**Lopolith**—In geology, massive intrusions of basic rocks which are generally concordant, have a lenticular shape, and are centrally sunken like a saucer or basin.

**Lorry**—A long four-wheeled wagon.

**Lost Corner**—A corner whose position cannot be determined, beyond reasonable doubt, either from traces of the monument, or by reliable testimony relating to it; and whose location can be restored only by surveying methods and with reference to interdependent existent corners, by mutual agreement of abutters or by Court decision.

—**Head**—In hydraulics, the energy converted into heat as a result of friction, eddies, and impact, expressed as the height of a column of water whose potential energy is equivalent to that loss.

**Lot**—All the reinforcement bars of the same nominal weight per foot in a carload. This definition applies to any grade of reinforcement bars.

—(loosely) Any unit group.

—**Unit** (in marine use)—The quantity of a commodity contained in a standard pile covering 120 square feet.

**Loudness Contours**—In acoustics, curves of equal loudness for sinusoidal sound waves.

**Louver**—A ventilating window shielded from the weather by sloping slats.\*

**Low Bridge**—A bridge over navigable water so low that some vessels cannot go beneath it without an opening passage being provided in the structure.

—**Pass Wave Filter**—In acoustics, a selective transducer which efficiently passes waves of all frequencies from zero up to a certain frequency—called the cut-off frequency—and effectually bars waves of all higher frequencies.

—**Potential Current**—In electricity, low voltage current.

**Low Pressure Orifice Test**—A method of accurately measuring the air delivered by a compressor.

—**Steel**—A soft steel containing a small amount of carbon, less than one-fourth of one per cent.

—**Water**—The minimum height reached by each falling tide or by water in any place (abbreviated L.W.)

**Lowry Process**—In wood preservation, an empty cell process for treating wood with creosote in which there is injected, without a preliminary vacuum, an amount of creosote in excess of the required final retention, this excess then being removed by a quick high vacuum.

**Low-Wing Monoplane**—A monoplane in which the wing is located at, or near, the bottom of the fuselage.

**Luff**—To swing the boom of a derrick.

**Lug**—Any kind of a projection for carrying or supporting something.

**Lumber**—Timbers sawed or split into boards, planks, etc., and of comparatively small dimensions.

—**Finished**—Lumber that has been planed or surfaced.

- Rough**—Lumber as it comes from the saw before being surfaced.
- Lumen**—The unit of light flux in terms of which the output of light sources is expressed.
- Luminaire**—In highway lighting, a complete lighting device consisting of a light source, together with its direct appurtenances, such as globe, reflector, refractor, housing and such support as is integral with the housing. The pole, post or bracket is not considered a part of the luminaire.
- Lump Lime**—Quicklime as drawn or discharged from the kiln.
- Lime Screened**—Lump lime after forking or screening to remove the finer particles. Note—The portion removed is usually that which will pass a  $\frac{1}{2}$ -inch sieve.
- Lime Selected**—Lump lime, select both by hand picking to remove foreign material and overburned or underburned particles and by forking or screening to remove particles which will pass a  $\frac{5}{8}$ -inch sieve.
- Lumpy**—The condition of a rail having a succession of short and sharp bends.
- Lunar Component, Principal**—(See principal lunar component.)
- Lunitidal Interval**—(high water) The interval between the moon's meridian passage (upper or lower) and the following high water (abbreviated H.W.I.).
- (low water) The interval between the moon's meridian passage and the following low water (abbreviated L.W.I.).
- Lutaceous**—A term relating to rock flour and other materials of clay size.
- Lute**—A mixture of fire-clay, used to seal cracks when heat is applied to furnaces.
- A short piece of wood, sometimes triangular, fastened on a handle, used to level loose material.

# M

**Macadam**—A road crust composed of stone or similar material broken into irregular angular fragments compacted together so as to be interlocked and mechanically bound to the utmost possible extent.

—**Aggregate**—In bituminous work, a coarse aggregate consisting of fragments of substantially one size or a limited range of sizes, the smallest of which is  $\frac{1}{4}$  inch.

—**Waterbound** — (See waterbound macadam.)

**Machine-Banded Pipe**—Wooden pipe made in certain lengths and joined in the field by couplings. The staves are wrapped by wire, in a machine.

**Macrograph**—A graphic reproduction of any object magnified 10 diameters or less. When it is desired to indicate that it is a photographic reproduction, the term "photomicrograph" may be employed.

**Macrostructure**—A structural feature of rocks that can be discerned by the unassisted eye, or with the help of a simple magnifier.

**Madeland**—Areas of artificial fills of soil material more or less mixed with waste, refuse, and debris.

**Magma**—Liquid molten rock, or rather hot silicic solutions containing water and gases from which igneous rocks are formed.

**Magmatic**—Of or pertaining to magma.

—**Differentiation**—In petrology, the process by which different types of igneous rocks are derived from a single parent magma, or by which different parts of a single molten mass assume different compositions and textures as it solidifies.

—**Waters**—In geology, refer to those waters given off by cooling mag-

mas and in a sense generated anew by the combining of gases from the igneous mass.

**Magnification**—The ratio of the size of an image to that of the object. Magnification is generally expressed in "diameters," thus " $\times 100$ " or "100 diameters."

**Magnesite**—Magnesium carbonate,  $MgCO_3$ .

**Magnet Coil**—In electricity, a coil of insulated wire surrounding the core of an electro-magnet, and through which the magnetizing current is passed.

—**Wire**—In electricity, that insulated annealed copper wire used with electro-magnets.

**Magnetic Adhesion**—The state of two bodies being stuck together due to the force exerted by the magnetic flux.

**Magnetism, Axis of**—(See axis of magnetism.)

**Magnetite**—A magnetic iron oxide,  $Fe_3O_4$ , containing 28 per cent oxygen, and 72 per cent iron.

—**Filter**—A straining device usually placed on top of a settling tank, through which the settled effluent passes. Filtering material consists of magnetite iron ore; cleaned by means of an electro-magnet.

**Magneto, Booster**—An auxiliary magneto used for starting.

**Main**—In water supply and drainage, a principal conduit, pipe line or conductor.

—**Canal**—The main conduit beginning at the source of water supply, from which the lateral system receives its supply.

—**Line**—The principal line or lines of a railway.

**Main Longitudinal**—A main longitudinal strength member of a rigid airship, which connects the various transverse frames.

- Mooring Cable**—The wire cable by which an airship is hauled in to a mooring mast.
- Mooring Line**—The line dropped from the bow of an airship to be coupled to the main mooring-mast line.
- Mooring-Mast Line**—A line leading from the main winch of a mooring mast through the mooring attachment at the top of the mast for the purpose of attaching the main mooring line of an airship.
- Sewer**—A sewer into which the sewage from two or more sub-main or branch sewers is discharged. Also called trunk sewer.
- Shear Wire**—A diagonal wire taking up main shear loads in the structure of a rigid airship.
- Track**—The running track of a railway whereon the movement of trains is controlled by timetable, train order or block signal. For multiple main track generally the southerly or easterly main track shall be designated as the first main track and the adjacent one as the second main track, etc.
- Transverse**—One of the main transverse strengthening frames of a rigid airship provided with wire or girder bracing and spaced at regular intervals throughout the length of the airship.
- Mains**—The system of large water pipes that supply the smaller laterals or service pipes.
- The principal pipes to which branches and connections are made.
- Maintainer**—Equipment designed to level or smooth highway surfaces, usually traffic bound or earth surfaces.
- Maintenance**—The operations performed in preserving a road, bridge, or structure in its original condition without increasing the inventory value. Repairing is part of maintenance.
- Cost**—A term used in economics of highway planting, which is construed as significant of all of those items of expenditure necessary to maintain the various components of the highway in satisfactory working condition without increasing the existing inventory value of the highway plant proper.
- Expenses**—In engineering economics, the annual expense for repairs and entire renewals of plant units.
- Routine**—Repairs or maintenance work done by local forces. The work usually consists of spot and shoulder patching, sealing of small sections and similar work. This periodic maintenance probably takes care of all other regular maintenance required regardless of the type of surfacing, ditches, weeds, snow removal, etc.
- Special**—Repairs or work done by general or district forces, not as a matter of continuous routine but on specific jobs for which they are called. The work usually consists of large-section seal-coating or large-scale repairs or construction.
- Major Betterments**—A term used in economics of highway planning to include reconstruction projects where the salvage value of the old work is considerable, and where service life values of a road or bridge are increased.
- Malachite**—A greenish copper mineral,  $2\text{CuO} \cdot \text{CO}_2 \cdot \text{H}_2\text{O}$ , containing 20 per cent carbon dioxide, 72 per cent cupric oxide, and 8 per cent water. An ore of copper.
- Malchite**—Types of diorite dikes which contain feldspar and hornblende, phenocrysts of plagioclase, hornblende and biotite in a ground-mass of quartz.
- Malleable**—Capable of being extended or shaped by beating with a hammer. Capable of being shaped by a heating or rolling process.
- Pig**—Pig iron used for making malleable castings.

- Malleablizing**—A type of annealing operation with slow cooling whereby combined carbon in white cast iron is transformed to temper carbon and in some cases the carbon is entirely removed from the iron.
- Maltha**—A very viscous asphaltic petroleum which usually hardens rapidly upon atmospheric exposure due to volatilization of its lighter constituents.
- Maneuver**—(a) To operate an aircraft in a skillful manner, so as to cause it to perform evolutions out of the ordinary. (b) To perform tactical or acrobatic evolutions with aircraft.
- Maneuverability**—That quality in an aircraft which determines the rate at which its attitude and direction of flight can be changed.
- Maneuvering Valve**—A manually operated valve fitted to the envelope, ballonet, or gas cell of an aerostat for the purpose of releasing gas or air from within the envelope or gas cell as desired.
- Maneuvering-Valve Hood**—A hood, or cowl, located on the outer cover of a rigid airship just over a maneuvering valve. It is usually made of light wood or fabric and is faced to facilitate the escape of gas.
- Manganese Steel**—Steel containing about 12 per cent of manganese.
- Manganin**—In electricity, a resistor material composed of nickel, copper, and manganese.
- Manhole**—An opening by which a man may enter a sewer, cistern or conduit for inspection, cleaning or repairing.
- Appendix**—A short appendix of large diameter used for access to the interior of the envelope of an aerostat.
- Head**—The cast iron fixture surmounting a manhole. It is made up of two parts: a "frame" which rests on the masonry of the shaft, and a removable "cover." Frames are either "fixed" or "adjustable" (for height). Covers are "tight," "ventilated," or "anti-rattling."
- Manjak**—A black variety of bitumen having a brilliant luster and conchoidal fracture; hardness about 2.
- Manning's Formula**—A formula for the value of the coefficient,  $C$ , in the Chezy formula, the factors of which are the hydraulic radius and a coefficient of roughness.
- Manometer**—A U-shaped tube containing a liquid, the surface of which moves proportionally to changes of the elastic pressure of gases; a tube type of differential pressure indicator; a pressure gage.
- Pressure (aerostat)**—(aeronautic) (See pressure, manometer.)
- Mansard Roof**—In architecture, a hipped roof having a double slope on all sides.\*
- Mantle Rock**—In geology, the loose, more or less consolidated rock material resting on solid or bed rock.
- Manure**—A mixture of straw or hay and animal excrements. A "green manure" crop refers to a cover crop.
- Crop**—Synonymous with cover crop, although stress is laid on fertilizing value, when plowed under.
- Map**—A representation to a definite scale on a horizontal plane of the physical features of a portion of the earth's surface (natural or artificial or both) by means of symbols, which may emphasize, generalize, or omit certain features as conditions may warrant. A map may be derived from ground surveys made by transit, plane-table, or camera, or from aerial photographic surveys, or both. However, under this definition the aerial photographs themselves, whether prints or mosaics, cannot be classed as maps, because all points that are not in the assumed ground plane are displaced toward or from the center of the picture, and hence do not stand in the same relation to each other as they do in a hori-

zontal projection. In order to distinguish the various maps made by aerial photography the following terms have been proposed: (1) Aerial Line Map; (2) Aerial Topographic Map; and (3) Aerial Stereotopographic Map. The first does not show contour lines. The second does show contour lines. In the third the contours have been determined by the use of stereoscopic methods. See, also, Cadastral Map; Hypsometric Map; Planimetric Map; Stereometric Map; and Topographic Map.

**Marble**—Any crystalline or micro-crystalline natural rock deposit of sedimentary origin composed principally of calcium carbonate or calcium and magnesium carbonates. This classification includes also those serpentines that are of igneous origin as well as those of sedimentary origin.

—**Bardiglio**—(See Bardiglio marble.)

—**Bird's Eye**—(See bird's eye marble.)

—**Carrara**—(See Carrara marble.)

—**Decorative**—(See decorative marble.)

**Marcasite**—An iron disulphide,  $\text{FeS}_2$ , containing 53 per cent sulphur and 47 per cent iron.

**Margin of Safety** (stress analysis)—The difference between the ultimate load and any applied load.

**Marker, Boundary**—A painted cone, solid circle, disk, or other device used to mark the boundary of the available landing area on an airport or landing field.

—**Circle**—A circular band marking the approximate center of the landing area or the intersection of the principal landing strips on an airport or landing field.

**Marl**—An earthy mixture of minerals consisting of quartz, clay, calcite, and sometimes glauconitic sands. It is quite often found in swamps and in lakes.

**Marline**—A small fiber twine used for serving.

—**Spike**—A tapered steel pin used for splicing or other rope work.

**Marmorosis**—A name for the process of crystallization of limestones to marble, whether by contact or regional metamorphism.

**Marsh**—Flat, wet, treeless areas usually covered by standing water and supporting a native growth of coarse grasses, reeds, or rushes.

**Masonry**—Masonry, in its widest sense, includes all construction of stone or kindred substitute materials, in which the separate pieces are either placed together, with or without cementing material to join them; or encased in a matrix of firmly cementing material. In usual practice, the word "masonry" is qualified by some proper term to more particularly describe the masonry under consideration, such as stone, concrete, brick, etc.

—**Ashlar**—(See ashlar.)

—**Checks**—Used in soil erosion and roadside development to refer to ditch barriers built of rock and mortar 24 to 30 inches deep and 8 to 10 inches thick, with the surface flush and conforming to the cross section of the ditch.

—(See check dams.)

—**Dam**—A dam built of rock and mortar.

—**Greek**—(See Greek masonry.)

—**Plate**—A base plate resting on masonry.

—**Rubble**—Masonry composed of unsquared stones. (See rubble.)

**Mass**—Quantity of matter.

—**Action, Law of**—(See law of mass action.)

—**Active**—(See active mass.)

—**Diagram**—A graphical representation of cumulative quantities, such as the integral of a time-flow curve; each point on a curve is the sum of all preceding quantities considered.

—In earthwork, a graphical representation of the algebraic cumu-

- lative quantities of cut and fill where cut is + and fill is —.
- Movement**—Unit movement of a portion of the land surface, as in creep, landslide, earthflow, or subsidence.
- Pound**—A unit of weight equal to 0.4535924 times the mass of the international prototype kilogram.
- Massif**—A single mountainous mass which may be considered a unit.
- Massive**—In petrology, of homogeneous structure, without stratification, flow-banding, foliation, schistosity, and the like.
- Mast**—An upright post of timber or steel, as the mast of a derrick.
- Mooring**—(See mooring mast.)
- Pin**—A vertical pin at the top of the mast of a derrick.
- Radio**—(See radio mast.)
- Seat**—The casting at the foot of a mast on which it rests and turns.
- Yaw Line**—One of the two lines leading from the winches at the base of the mooring mast through snatch blocks and carried to the leeward of the mast 60 deg. from the wind direction. The airship's yaw lines are coupled to these lines. The snatch blocks are fixed to anchorages selected so that the joined lines tend to keep the bow of the airship into the wind and prevent its overriding the mast. These lines are sometimes called "mast yaw guys" or "mast bow-steadying lines." (The main mooring line and the yaw guys, when taut, establish a fixed point in space.)
- Master Track Scale**—A track scale especially designed for the calibration of railway test weight cars or for other special weighing where extreme accuracy is required.
- Mastic**—A mixture of bituminous material and fine mineral matter suitably made for use in highway construction and for application in a heated condition.
- Bed**—(for brick pavement) This type is composed of fine aggregate and bituminous materials (tar or asphalt) thoroughly mixed. Approximately 5 per cent of bituminous materials by volume is used.
- Mat**—A bituminous layer of appreciable thickness, generally formed on top of a pavement by the application of one or more coats of bituminous material with gravel or stone chips added. (See carpet.)
- Match-marking**—A system of marking the parts or members of a structure so that they always may be connected up in exactly the same order and manner.
- Mathematical Function**—(See function.)
- Mathematics**—The science treating of the exact relations existing between quantities or magnitudes and operations and of the methods by which, in accordance with these relations, quantities sought are deducible from others known or supposed.
- Matrix**—The binding material or mixture of binding material and fine aggregate in which the large aggregate is imbedded or held in place.  
(rock) The general mass of a rock which has isolated crystals, sometimes called groundmass.
- Matte Print**—(photography) A photograph with a dull, lusterless surface.
- Matter, Colloidal**—Very finely divided matter in a state of suspension which must be coagulated before removal by sedimentation or filtration.
- Organic**—Vegetable or animal matter encountered in water.
- Suspended**—Matter contained in water which may be removed by filtration, coagulation or sedimentation.
- Mattress**—A strong mat consisting of various materials, bound or woven together used for the protection of the surface of the erod-

- ing banks or bottom of an alluvial river.
- Ballast**—Stone riprap placed on any wood mattress to sink it and make it conform to the river bed.
  - Board**—Mattress woven with boards, alternately headers and stretchers.
  - Brush and Wire Envelope**—Brush laid in two layers between woven wire netting which is tied together with wires. Bottom of netting envelope parallel to bank, top normal to bank. Bottom brush layer normal to bank, top parallel.
  - Concrete**—Mattress of reinforced concrete slabs. Slabs generally overlap and connect.
  - Willow** (basket woven)—Willow brush woven similar to chip basket with selvage of roll fascine bound to mattress by wires.
  - Willow** (brush and weaving pole)—Willow brush laid normal to bank of river, lake or bay with poles parallel. Poles on top and bottom tied together by wires.
  - Willow** (brush and wire envelope)—Willow brush laid in two layers between square mesh netting. Bottom of netting envelope parallel to bank of stream, lake or bay, top normal to bank. Bottom brush layer normal to bank, top parallel.
  - Willow** (pole and fascine)—Willow brush bound together in bundles or fascines one to two feet diameter and laid normal to bank of river, lake or bay between poles which are tied together by wire or twisted wire strand.
  - Maximum Sound Pressure**—In acoustics, the maximum sound pressure for any given cycle is the maximum absolute value of the instantaneous sound pressure during that cycle. The unit is the dyne per square centimeter.
  - McLeod Tool**—A combination hoe and rake with removable blades.
  - Mean**—A quantity having an intermediate value between several others of which it expresses the average; usually, unless otherwise specified, the one simple average obtained by dividing the sum of the quantities by their number.
  - Depth**—(hydraulics) The cross-sectional area of a stream divided by its surface width.
  - Free Path**—In architectural acoustics, the mean free path for sound waves in an inclosure is the average distance sound travels in the inclosure between successive reflections.
  - High Water**—The average of all high waters of a series of observations.
  - Line** (of an airfoil profile)—(aeronautic) An intermediate line between the upper and lower contours of the profile.
  - Low Water**—The average of all low waters of a series of observations.
  - Range**—(tide) The average difference in the heights of high and low water at any given place.
  - Sea Level**—The plane about which the tide oscillates.
  - The mean level of the sea at a given station; that is, the mean elevation of the tidal curve. It varies somewhat from place to place.
  - Tide Level**—The plane half way between mean low water and mean high water.
  - The plane, or surface, that lies exactly half-way between mean high water and mean low water (also called "Half-Tide Level"). On account of the lack of symmetry of the tidal curve, this is not exactly the same as Mean Sea Level.
  - Velocity**—(hydraulics) The velocity at a given section of a stream obtained by dividing the discharge of the stream by the cross-sectional area at that section.
  - Measuring Weir**—In hydraulics, a device for measuring the flow of water. It generally consists of rectangular, trapezoidal, triangular, or other shaped notch in a thin plate with a vertical plane through

which the water flows. The weir head is an index of the rate of flow.

**Measurement Cargo** (in marine use)

—Cargo that stows more than 40 cu. ft. to the ton of 2240 lb., or weighs less than 56 lb. per cu. ft.

**Measures, Coal**—(See coal measures.)

**Mechanical Efficiency**—The ratio of the energy or work that is gotten out of a machine, to the energy put in.

—(for compressors) The ratio of the air indicated horsepower to the indicated horsepower in the power cylinder, in the case of steam driven or internal combustion engine driven compressors, and to the brake horsepower delivered to the shaft in case of a power-driven machine.

—**Pilot**—(See automatic pilot.)

**Mechanics**—The science of force and its effect upon matter.

**Medallion**—In architecture, an ornament having a rounded or elliptical shape.\*

**Medium Curing Cut-Back**—Asphalt cement fluxed with a kerosene type of distillate. Usually designated as M.C.

—**Pointed or "M.P."**—In stone masonry, this refers to the dressings in which the point depressions are approximately  $\frac{5}{8}$  to  $\frac{3}{4}$  inch apart with surface variations not exceeding  $\frac{1}{4}$  from the pitch line.

—**Screen** (sewage)—A screen having openings intermediate between those of a coarse and a fine screen.

—**Steel**—Steel containing from 0.15 to 0.30 per cent of carbon. Used especially for structural purposes.

**Medium-grained**—(rock) Refers to rocks whose crystals have an average diameter of between 1 and 5 mm.

**Megascopic**—A term applied to observations with the unaided eye, as opposed to microscopic, made with the aid of the microscope.

**Megohm**—An electrical unit being equal to one million ohms.

**Melanocratic**—A name for those eruptive rocks in which the dark or ferromagnesium minerals are in excess over the light ones.

**Melt**—To fuse or liquefy by applying heat.

**Melting-point**—The temperature at which a metal passes from the solid to the liquid state.

**Melt-numbers**—The number given a heat or charge and carried by the product throughout the processes of rolling and fabrication.

**Member**—A component part of a bridge or other structure, complete in itself.

—**Primary**—A principal part of a truss or floor system, generally restricted to trusses.

—**Secondary**—A subordinate part of a bridge, as a lateral.

**Merestones**—Old English term for street boundary markers.

**Meridian**—A great circle on the surface of the earth, passing through the poles and any given place.

—**Passage** (moon)—Refers to the instant when the moon is directly above the meridian, and also the instant when the moon is directly below the meridian, or 180 deg. distant in longitude. They are known as the upper and lower transits.

**Mesa**—A high, broad, flat table-land, bounded, at least on one side, by a steep cliff rising from lower land.

**Mesh**—The square opening of a sieve.

—**Fabric**—(See wire mesh.)

—**Screen**—A screen or sieve composed of a fabric, usually of wire, having square openings.

**Mesophilic Digestion**—Digestion by bacteria having their optimum range of activity between 28 and 37 degrees Centigrade.

**Mesozoic**—One of the grand divisions or eras of geologic time, following the Paleozoic and succeeded with the Cenozoic era, comprising

the Triassic, Jurassic, and the Cretaceous periods.

**Messenger Line**—Rope used for moving ships short distances.

—**Strand**—Strand used for supporting telephone or telegraph cable.

**Metacinnabarite**—A mercuric sulphide having the formula  $\text{HgS}$ . Contains about 14 per cent sulphur and 86 per cent mercury.

**Metal**—As used in bridgework, this term means steel, unless specifically stated otherwise.

—**Bath**—(See bath metal.)

—**Bell**—(See bell metal.)

—**Box**—(See box metal.)

—**Bush**—(See bush metal.)

—**Composition** — (See composition metal.)

—**Cylinder**—(See cylinder metal.)

—**Earth**—(See earth metal.)

—**Pot**—A poor grade of cast iron.

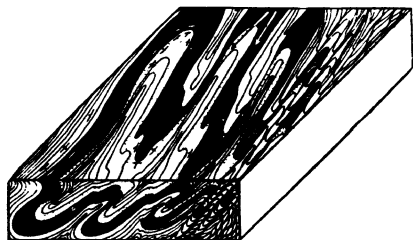
—**Road**—(See road metal.)

**Metallography**—That branch of science which relates to the constitution and structure, and their relation to the properties, of metals and alloys.

**Metamorphic Rocks**—Those rocks which have been changed by temperature, pressure, and chemical fluids into new forms being more stable under the new conditions. Some examples are, gneisses, schists, marbles, etc.

**Metamorphism, Contact**—(See contact, metamorphism.)

—**Dynamic**—(See dynamic metamorphism.)



*Block diagram showing the effect of compressive crustal movement upon horizontal strata, in metamorphism.*  
(After Wegmann)

—**Local**—(See local metamorphism.)

—**Regional**—(See regional metamorphism.)

—**Static**—(See static metamorphism.)

**Metasomatism**—In petrology, the processes by which one mineral is replaced by another of different chemical composition owing to reactions set up by the introduction of material from external sources.

**Metastable**—The condition reached by a cooling magma solution which being supersaturated, crystallization is instantly induced by the introduction of a solid.

**Meteoric Waters**—Those derived from rain or snow and penetrating into the crust from above.

**Meteorograph**—A recording instrument for obtaining meteorological information above the earth's surface. It contains elements to record temperature, pressure, and humidity. (Also called aerograph.)

**Meteorology**—The study of the physical processes which occur in the atmosphere, and of the connected processes of the lithosphere and hydrosphere.

**Meter**—The metric term for 39.37079 inches.

—Approximately one ten-millionth part of a quadrant of the earth's surface, computed on a meridian passing from either pole to the equator.

—An instrument or mechanism for measuring flow or mass in motion.

—**Current**—A device for measuring the velocity of flow in streams and channels.

—**Water**—An instrument for measuring and recording automatically the flow of water through it.

**Metope**—In architecture, the space between the triglyphs of the Doric order.\*

**Metric Ton**—1,000 kilograms or 2,204.6 pounds.

**Mexican Onyx**—A variety of calcite (limestone) found chiefly in Mex-

- ico, and used for interior decorations.
- Mgad**—Million gallons per acre per day of trickling filter area.
- Miarolitic**—In petrology, containing small interstitial cavities, formed when the rock solidified, into which small crystals may project; also characteristic of, pertaining to, or occurring in such cavities.
- Micarta**—In electricity, an insulating material composed of mica and paper.
- Mica-schist**—A schist composed essentially of micas and quartz, the foliation being mainly due to the parallel disposition of the mica-flakes.
- Micelle**—The term designating each particle of the dispersed phase in a colloidal suspension.
- Microline**—A potash feldspar showing cross-hatching in thin section.
- Microcrystalline**—(rock) Refers to granular rocks in which the various constituents can be determined only with the microscope.
- Micrograph**—A graphic reproduction of any object magnified more than 10 diameters.
- Microhm**—An electrical unit being equal to one-millionth ohm.
- Microolithic**—Composed of small stones.
- Micron**—A linear unit equal to one-thousandth of one millimeter.
- Microperthite**—Microscopic perthite, a term applied to that variety of orthoclase thickly set with flat spindles of albite. It is common in gneisses.
- Middle Ordinate**—The (radial) distance from the middle point of a chord of a circular curve to the middle point of the corresponding arc.
- Point (M. P.)**—That point on a circular curve which is equi-distant from the two ends of the curve.
- Strip**—A portion of a flat slab panel one-half panel in width, symmetrical with respect to the panel center line and extending through the panel in the direction in which bending moments are being considered. That part of a panel of a flat slab lying between the two column strips.
- Mid-span**—The center of a span.
- Midwing Monoplane**—A monoplane in which the wing is located approximately midway between the top and bottom of the fuselage.
- Mil, Circular**—(See circular mil.)
- Mild or Soft Steel**—Steel containing less than 0.15 per cent of carbon.
- Mill, Blooming**—(See blooming mill.)
- Cyanide**—(See cyanide mill.)
- Pug**—A continuous mixer with blades revolving on a central shaft in a container open at the end so mixed material can flow out. Used extensively in making bituminous mixtures and stabilized soil mixtures.
- Pug, Batch**—A mixer with blades revolving on a shaft or shafts in a container in which proportioned parts of aggregates and bituminous material are thoroughly intermingled. A door in the bottom of the container allows the mixture to be removed.
- Millacre**—One-thousandth part of an acre. A plot having the dimensions of 6.6 feet by 6.6 feet.
- Milliampere**—An electrical unit, being 1/1000 of an ampere.
- Millimeter**—A metric measure of length, equal to 0.0394 of an inch.
- Milling**—The process of removing metal with a circular cutter in a milling machine.
- As of a rail, the cutting of the ends of rails with a milling hob to eliminate roughness and inaccuracies of sawing.
- Machine**—A machine consisting of a rotating mandrel carrying a milling cutter, and a movable table, operated by a feed screw, to which is bolted the object to be milled.
- Millivolt**—A unit of electrical energy or 1/1000 part of a volt.
- Mineral**—A natural inorganic sub-

- stance of definite chemical composition.
- Blossom**—Drusy quartz.
  - Filled Asphalt**—Asphalt cement containing an appreciable percentage usually between 10 and 50 per cent by weight) of very finely divided mineral matter passing the 200-mesh sieve.
  - Filler**—A very finely divided mineral product the great bulk of which will pass a 200-mesh sieve. Pulverized limestone is the most commonly manufactured filler, although other stone dust, silica, hydrated lime and certain natural deposits of finely divided mineral matter are also used.
  - Jelly**—Vaseline.
  - Soils**—Soil composed mainly of inorganic (mineral) material with relatively low contents of organic material.
  - Wool**—A substance composed of very fine, interlaced mineral fibers having the appearance of loose wool, or cotton. It is a fibrous glass-like material composed principally of silicates of calcium and aluminum, together with other minor constituents.
  - Mineralize**—To change from a metal into a mineral; as iron when exposed to the air is mineralized into rust.
  - Mineralogy**—That science which treats of those inorganic species called minerals, which together in rock masses, or in isolated form, make up the material of the earth's crust.
  - Miners Inch**—A stream of water from an orifice 1 inch square under a definite head, used as a unit of measurement and independent of time.
  - Minette**—In petrology, a syenitic lamprophyre composed essentially of biotite, mica and orthoclase feldspar, usually dark and fine grained and occurring in dikes.
  - Minimum Flying Speed**—The lowest steady speed that can be maintained, with any throttle setting whatsoever, by an airplane in level flight at an altitude above the ground greater than the span of the wings.
  - Gliding Angle**—The acute angle between the horizontal and the most nearly horizontal path along which an airplane can descend steadily in still air when the propeller is producing no thrust.
  - Minor Betterments**—A term used in economics of highway planning to include that group of reconstruction projects where inventory values are increased, but service life values of a road or bridge are not lengthened.
  - Minus Sight**—See Foresight.
  - Minute**—(in time) The sixtieth part of an hour, sixty seconds.
  - (in surveying) One-sixtieth of a degree.
  - (in circular measure) 0.000290 radian.
  - Miocene**—The third of the four epochs into which the Tertiary period is divided. Also the series of strata deposited during that epoch.
  - Mirabilite**—Glauber's salt. Hydrrous sodium sulphate,  $\text{Na}_2\text{SO}_4 + 10\text{H}_2\text{O}$ .
  - Miter**—The joint between two beveled edges, the bevel being usually 45 degrees.
  - Sill**—(See clapsill.)
  - Mitis Metal**—An alloy of wrought iron and aluminum.
  - Mix**—(or mixture) The resultant mass obtained by intimately intermingling the several constituents of the mass.
  - Mixed Flow Pump**—A pump in which the head is developed partly by centrifugal force and partly by the lift of the vanes on the liquid. This type of pump has a single inlet impeller with the flow entering axially and discharging in an axial and radial direction, usually into a volute type casing. Pumps of this type usually have a specific speed of from 4,000 to 9,000.

- Type Tide**—A tide in which two high and two low waters occur in a day, exhibiting marked diurnal inequality in the two highs or in the two lows.
- Mixer, Batch**—A machine for intimately intermingling aggregates and cement with water in separate complete units of proportional amounts as distinguished from concrete mixed by a continuous mixer.
- Bituminous**—(See batch pug mill.)
- Continuous**—A machine designed to maintain an unbroken process of concrete mixing. Continuous mixers are now little used in concrete work, but extensively used in bituminous and soil stabilization work as pug mills.
- Mixing Tank**—Tank equipped with agitating apparatus for making solutions.
- Mixture Control, Altitude**—(aeronautic) A device on the carburetor for regulating the weight proportions of air and fuel supplied to the engine at different altitudes.
- Mode**—The actual mineral composition of an unaltered igneous rock.
- Modillion**—In architecture, an ornamental bracket occurring in the entablature of the Corinthian order.\*
- Module**—(hydraulics) A device for delivering a definite quantity or discharge of water, or for measuring and controlling the flow.
- In architecture, an accepted system of measurement of the Classic orders. One module being taken as equal to the semidiameter of the column just above the base. It is generally divided into 30 equal divisions or parts.\*
- Modulus, Fineness**—(See fineness modulus.)
- Of Elastic Resilience**—The energy given up per unit of volume when the stress on a material is released.
- Of Elasticity**—The stress required to produce unit strain, which may be a change of length (Young's modulus); a twist or shear (modulus of rigidity), or a change of volume (bulk modulus), expressed in dynes per square centimeter.
- Of Rigidity**—Also called shearing modulus of elasticity and modulus of transverse elasticity. The ratio of the unit stress developed in a section under test to the unit depression.
- Section**—(See section modulus.)
- Moil Point**—A round, hexagonal or other shaped alloy tool steel rod sharpened to a square pyramidal point to be used with air hammers for breaking concrete, brickwork, or other hole punching work.
- Moisture**—Essentially water, quantitatively determined by definite prescribed methods which may vary according to the nature of the material.
- Content**—(in general) Percentage of water by weight in a given volume by weight.
- Content**—In soil technology, the weight of moisture in the soil in percentage of the weight of the soil particles.
- Content**—(of wood) The amount of moisture in wood, usually expressed as percentage of the dry weight of wood.
- Content, Optimum**—(See optimum moisture content.)
- Critical**—(See critical moisture.)
- Equivalent, Centrifuge**—(soil technology) The amount of moisture, expressed as a percentage of the weight of oven-dried soil, retained by a soil which has been first saturated with water and then subjected to a force equal to 1,000 times the force of gravity for one hour.
- Equivalent, Field**—(See field moisture equivalent.)
- Hygroscopic**—In wood, water which is absorbed by the cell walls as distinguished from "free water" in the cell cavities.
- Water which is adsorbed on the

surface of particles and which cannot be pressed, squeezed or evaporated out.

- In soil technology, moisture in soil expressed as a percentage of the weight of the oven-dried soil expressed by the formula

$$\frac{\text{Hygroscopic moisture} = \text{wt. of air-dried soil} - \text{wt. of oven-dried soil}}{\text{wt. of oven-dried soil}}$$

times 100.

To correct the weight of the air-dried sample for hygroscopic moisture, the given value shall be multiplied by the expression

$$\frac{100}{100 + \text{per cent of hygroscopic moisture}}$$

**Molar Solution**—Contains 1 gram molecular weight of dissolved substance per liter of solution.

**Mold**—A form or model pattern of a particular shape, used in fixing the shape of a plastic mass.

—Any of the lower fungi.

**Mole**—A mass numerically equal to the molecular weight.

—Gram—(See gram, mole.)

**Molecular Volume**—Volume occupied by one mole. Numerically equal to the molecular weight divided by the density.

**Molecule**—The smallest part of a substance that can exist separately and still retain its composition and characteristic properties.

**Molybdenite**—A mineral of molybdenum having the formula  $\text{MoS}_2$ . Contains about 40 per cent sulphur and about 60 per cent molybdenum.

**Moment, Bending**—The moment which produces or tends to produce bending in a beam or other member of a structure. It is measured by the algebraic sum of the products of all the forces by their respective lever arms.

—**Horizontal**—A moment acting in a horizontal plane.

—**Negative**—A relative term used to denote direction of rotation, usually taken counter-clockwise.

—**Of Inertia**—A function of some property of a body or figure—such as weight, mass, volume, area,

length, or position, equal to the summation of the products of the elementary portions of such property, of said body or figure, by the squares of their distances from a given axis.

—**Of Torsion**—The sum of all the moments of the internal forces in a body that is resisting a twisting moment. It is equal to the sum of the moments of all the applied forces that tend to produce torsion.

—**Positive**—A moment acting in the opposite direction to a negative moment, or acting clockwise.

—**Trimming**—(aeronautic) (See trimming moment.)

**Moment-area Method**—The method for finding deflections in a framed structure by use of the moment area curve.

**Monel Metal**—A whitish alloy of high tensile strength and elastic limit, consisting of nickel 75 per cent, copper 23.5 per cent, and iron 1.5 per cent.

**Monochromatic Emissive Power**—Is the ratio of the energy of certain defined wave lengths radiated at definite temperatures to the energy of the same wave lengths radiated by a black body at the same temperature and under the same condition.

**Monocoque Fuselage**—A fuselage construction which relies on the strength of the skin or shell to carry either the shear or the load due to bending moments. Monocoques may be divided into three classes (reinforced shell, semi-monocoque, and monocoque), and different portions of the same fuselage may belong to any one of these classes. The reinforced shell has the skin reinforced by a complete framework of structural members. The semimonocoque has the skin reinforced by longerons and vertical bulkheads, but has no diagonal web members. The monocoque has as its only reinforce-

ment vertical bulkheads formed of structural members.

**Monolithic**—Made in one piece.

**Monoplane**—An airplane with but one main supporting surface, sometimes divided into two parts by the fuselage.

—**Equivalent** — (aeronautic) (See equivalent monoplane.)

**Monument**—The structure erected to mark the position of a corner. Permanence is implied. In a legal sense a Monument is any physical evidence of a boundary of real property.

**Monzonite**—(rock) A plutonic igneous rock intermediate between syenite and diorite.

**Moon's Meridian Passage**—(See meridian passage, moon.)

**Mooring**—A nautical term for tying up a boat.

—**Band**—A band of tape or webbing, over the top of a kite balloon, to which the mooring ropes are attached. It forms part of the mooring harness.

—**Cone**—The grooved conical member at the extreme bow of an airship which engages with a hollow cone at the top of the mooring mast and provides the coupling between the airship and the mooring mast.

—**Drag**—Same as tail drag.

—**Harness**—A system of webbing bands, fitted over the top of a balloon, to which the mooring ropes are attached; usually found only on kite or observation balloons.

—**Hawser**—Large rope used for pulling ship to dock.

—**Line**—Short length of rope with a loop in one end, used for holding boats to docks.

—**Line**—A line attached near the bow of an aircraft for securing it to the ground, buoy, anchor, or to a mooring mast.

—**Mast**—A mast or tower at the top of which there is a fitting to which

the bow of an airship may be secured.

**Mooring-Cone Outrigger**—(See outrigger, mooring-cone.)

**Moraine**—An accumulation of earth, stones, etc., carried and finally deposited by a glacier.

—**Terminal**—(See terminal moraine.)

**Mortar**—A material used in a plastic state, which can be troweled, and becomes hard in place, to bond units of masonry structures.

—A mixture of cement or lime with sand and water, forming a thick paste.

**Mortgage, Closed**—(See closed mortgage.)

**Mosaic**—In architecture, decorative surfaces composed of small units of stone, glass, etc. Frequently employed to ornament floors, walls, etc.\*

—**Controlled**—A mosaic in which the photographs have been adjusted by reference to accurate ground control so as to produce a continuous photographic representation of a part of the earth's surface.

—**Uncontrolled**—A mosaic in which the photographs have not been adjusted by reference to ground control.

**Mosses**—Used in roadside development to refer to either a bryophytic plant characterized by a small, leafy, often tufted stems, or any of the moss-like lichens, or to any of the pteridophytic plants of a moss-like habit or form, as club mosses.

**Motion**—A term used in granite regions to designate small paving-block quarries.

—**Newton's Laws of**—(See Newton's laws of motion.)

**Motor, Single Phase**—(See single phase motor.)

—**Two Phase**—(See two-phase motor.)

—**Universal** (in electricity)—(See universal motor.)

—**Vehicle**—Every vehicle which is

self-propelled and every vehicle which is propelled by electric power obtained from overhead trolley wires, but not operated upon rails.

**Motor-Generator**—In electricity, a generator propelled by electricity instead of by water, steam, etc.

**Mountain Cork**—(See asbestos.)

**Mounting Height**—In highway lighting, this term is defined as the perpendicular distance between grade and the center of the light source in the luminaire.

**Movable Bridge**—More correctly speaking, a movable span.

—**Dam**—A barrier that may be opened in whole or in part. The movable part may consist of gates, stop logs, needles, wickets, or any other device whereby the area for flow through or over the dam may be controlled.

—**Span**—Any span of a bridge that may be turned or raised in any manner to allow passage for vessels through or under the bridge.

**M.P.**—(See medium pointed.)

**m-Point**—(aerial photographic mapping) See Isocenter.

—(aerial photography) an assemblage of vertical aerial photographs.

**Muck**—Soft mud containing much vegetable matter.

—**Ditch**—A ditch 4 to 6 feet wide and 6 feet deep excavated in natural soil along crown center line to explore foundation conditions where character of material is not fully known or where there is a possibility that water will move between natural surface and bottom of levee or dam, and backfilled with puddled or tamped impervious material.

—**Soil**—Soil composed of thoroughly decomposed organic material, with a considerable amount of mineral soil material, finely divided and with few fibrous remains.

**Mud Cell Dike**—A honeycomb structure woven with brush with vertical cells six to eight feet square.

A mud cell dike may be 60 to 100 feet wide, with length determined by length of bank to be built out.

—**Cracks**—Irregular shrinkage cracks intersecting the surface of dried mud, or the same more or less filled and hardened into rock.

**Mudflow**—Flow of a torrent so heavily charged with earth and debris that the mass is thick or viscous and blocks of rock many feet in diameter can be carried in it.

**Mud-sill or Sub-Sill**—A timber bedded in the ground to support a framed bent.

**Mud-wall**—A small parapet or retaining wall built on top of a bridge abutment to prevent the earth backfill from sliding or washing down upon the coping. A planked abutment wall of a wood trestle bent bridge.

**Mulch**—A loose covering of straw, manure, sand, dust, etc., to reduce evaporation.

**Mulching**—Loosening soil to form a protective cover and to retard upward evaporation of moisture from the soil.

**Mull**—A porous more or less friable humus layer of crumbly or granular structure, not matted or only slightly so, with diffuse lower boundary, and admixture of mineral soil.

**Mullions**—In architecture, large vertical divisions of a window.\*

**Multi-Centered Arch**—(See arch, multi-centered.)

**Multi-plate**—Trade name for deeply corrugated plates, made in segments or sections, generally bolted together to form large pipe, arches and other structures.

**Multi-Stage Pump**—A pump having two or more impellers acting in series in one casing.

**Multiplane**—An airplane with two or more main supporting surfaces placed one above another.

**Multiple Cancellation**—The arrangement of the web members of a

- truss having more than two complete systems of diagonals.
- Digestion**—Digestion successively of sewage solids in more than two digestion tanks.
- Echo**—In acoustics, a multiple echo is a succession of separately distinguishable echoes from a single source.
- Proportions, Law of**—(See law of multiple proportions.)
- Truss**—A truss having a multiple cancellation web system.
- Multiple-arch Dam**—A barrier across a canyon, arroyo, valley or gully consisting of a series of arches supported by buttresses or piers. The load is transferred by the several arches to the foundation through the buttresses.
- Muntins**—In architecture, small members that divide the glass in a window sash.\*
- Mush**—A greasy mud sometimes found on bituminous crusts.
- Mushet Steel**—A steel produced by the Mushet process of recarburization, which consists of adding spiegel or other form of manganese.
- Mushy**—The condition of a casting containing an excessive number of blow holes, rendering it unsound.
- Mutules**—In architecture, rectangular blocks supporting the cornice of the Mutular Doric order.\*
- Mycelium**—The mass of thread-like elements forming the vegetative portion of a fungus.
- Mylonite**—A finely banded, crushed rock, consisting of minute grains of various minerals, often arranged in parallel layers by pressure and movement.
- Myrmekite**—A graphic granite, the eutectic of quartz and feldspar, common in pegmatites.

# N

**N.A.C.A. Cowling**—(aeronautic) A cowling enclosing a radial air-cooled engine, consisting of a hood, or ring, and a portion of the body behind the engine so arranged that the cooling air smoothly enters the hood at the front and leaves through a smooth annular slot between the body and the rear of the hood; the whole forming a relatively low-drag body with a passage through a portion of it for the cooling air.

**Nacelle**—(aeronautic) An enclosed shelter for personnel or for a power plant. A nacelle is usually shorter than a fuselage, and does not carry the tail unit.

**Nadir**—(aerial photography) The point on the ground plane that is vertically beneath the lens of an aerial mapping camera. (Sometimes called the Plumb Point or "Ground Nadir Point"). Plate Nadir Point—That point where a vertical ray through the rear nodal point of the camera lens pierces the plane of the photograph. (Sometimes called Photographic Nadir.) The nadir point is also called the v-Point; capital V usually indicates the ground nadir point, and small v the plate nadir point.

**Nail, Dating**—For timber, a nail having a date or symbol on its head, which is driven into timber to indicate the year in which it was treated or put into service.

**Naphtha, Petroleum**—A generic term applied to refined, partly refined or unrefined petroleum products and liquid products of natural gas, not less than 10 per cent of which distills below 347° F. (175° C.), and not less than 95 per cent of which distills below 464° F. (240° C.), when subjected to distillation in accordance with the Standard

Method of Test for Distillation of Gasoline, Naphtha, Kerosine, and Similar Petroleum Products of the American Society for Testing Materials. Note—The "naphthas" used for specific purposes such as cleaning, manufacture of rubber, manufacture of paints and varnishes, etc., are made to conform to specifications which may require products of considerably greater volatility than that set by the limits of this generic definition.

**Nappe**—In geology, a term referring to a bed, layer, or sheet.

—In hydraulics, a sheet or curtain of water overflowing a weir, dam, etc. The nappe has an upper and a lower surface.

**Napthalene**—A crystalline salt derived from coal tar. Melting point 70 deg. C. Boiling point 218 deg. C.

**Narrow-Base Terrace**—A terrace similar to a broad-base terrace in all respects excepting the width of ridge and channel; the base width of a narrow terrace is usually 4 to 8 feet.

**Native Asphalt**—Asphalt produced by natural processes of evaporation or distillation.

**Natural Bar**—A bar of sand or gravel formed in a river bed by the usual physical processes of stream flow or precipitation.

—**Bed**—(rock) The surface of a stone parallel to its stratification.

—**Cement**—Is the finely pulverized product resulting from the calcination of an argillaceous limestone at a temperature only sufficient to drive off the carbonic acid gas. Does not slake with water into an hydraulic cement unless ground.

—**Gas, Wet**—In petroleum geology, a natural gas high in gasoline content.

- Growth**—A term used in roadside development referring to the naturally occurring growth of plant, vegetable, and shrub life found adjacent to and along the roadside.
- Period**—In acoustics, the natural period is the reciprocal of the natural frequency. The unit is the second.
- Soil Foundation**—The undisturbed soil upon which the soil substructure, the subbase, the base, or the wearing surface, placed directly thereon, depends for its support.
- Navigable**—Capable of being navigated by water craft.
- Waterways, Natural**—A natural stream or channel of sufficient width and depth for practical navigation by water craft without dredging or construction of controlling works.
- Artificial**—A stream, channel or canal made navigable by dredging and/or construction of controlling works.
- Neap Range**—The range of the tides at the time of neap tides.
- Tides**—The tides occurring at the times of the first and third quarters of the moon.
- Neat Line**—The true face line of a building regardless of the projections of the stones. A line back of or inside of incidental projections.
- Work**—In stone masonry, that part of an abutment above the footing courses, which is generally equal to saying that part above the surface of the ground or water.
- N.E.C.**—The National Electric Code.
- Neck**—That part of a test specimen, subjected to tension, which shows a reduction of area of cross-section when the ultimate load is reached.
- Necking-Down**—The act of reducing the cross-section of a test specimen by stressing it beyond the yield point.
- Needle**—(hydraulics) A timber set on end to close an opening for the control of water; it may be either vertical or inclined; a form of stop-plank.
- Beam**—Floor beam of a Howe truss through the ends of which pass the vertical rods.
- A cross beam used in supporting a load, as in underpinning a wall.
- Negative**—(photography) Exposed camera plate or film. A plate or film is not a negative until it is exposed; after exposure, it may be an "undeveloped," or a "developed" negative.
- Reaction**—A reaction caused by an uplift, and therefore acting in an opposite direction to a reaction caused by a direct load.
- Reinforcement**—Reinforcement so placed as to take tensile stress due to negative bending moment.
- Rotation**—Rotation in a direction opposite to that of the hands of a clock.
- Shear**—A relative term usually applied to a shear producing a downward motion.
- Nelsonite**—A rock consisting of rutile and apatite as essential minerals, with ilmenite, pyrite and quartz occurring at places.
- Neocene**—The later of the two epochs into which the Tertiary period was formerly divided and at one time used by many geologists. It is no longer used.
- Nephelite**—A complex silicate containing potassium, sodium, aluminum, and silica.
- Nest**—(of rollers) A group of rollers, enclosed in a suitable frame or box, which support a bridge shoe.
- Nesting**—Method of placing uniform open shapes snugly together or smaller diameter pipe or castings within others for the purpose of conserving space in shipping.
- Net Charge**—A sum on the debit side, representing the entire amount or total of the charges resulting from any transactions after credits are deducted.
- Credit**—A sum representing the

entire amount or total of the credits resulting from any transactions after debits are deducted.

—**Duty of Water**—The irrigation water applied to a farm unit.

—**Weight** (stress analysis)—The gross weight, less some specific partial weight. Very often the partial weight is the dead weight of the wings, but it may be the useful load. The partial weight in question should always be clearly indicated by the context.

**Netting Wire**—Diagonal or circumferential wire netting fitted between the longitudinals over the entire hull of a rigid airship to transmit the lift of the gas cells to the structure.

**Neutral Axis**—The intersection of the no-stress surface of the section or beam with the cross-section of the section or beam. An axis of no stress.

—**Depth**—The depth of water in an open conduit that corresponds to uniform velocity for the given flow. It is a hypothetical depth under conditions of steady, non-uniform flow; the depth for which the surface and bed are parallel.

—**Flame**—A welding flame wherein the correct proportions of gases are supplied to the flame for perfect combustion.

—**Surface**—Applied to beams and sections; that part of a beam or section under a transverse load which remains unchanged in length by the load.

**Névé**—The mass of granular snow forming the upper part of a glacier.

**New Construction**—A term used in economics of highway planning which applies to highway projects on entirely new locations or reconstruction projects where the salvage value of the old work is incidental and negligible.

**Newton's Laws of Motion**—(1) Every body continues in its state of rest or of uniform motion in a straight

line except in so far as it may be compelled to change that state by the action of some outside force.

(2) Change of motion is proportional to force applied and takes place in the direction of the line of action of the force. (3) To every action there is always an equal and opposite reaction.

**Niche**—In architecture, a recess in a wall designed to receive sculpture.\*

**Nichrome**—A resistance material composed of iron, nickel, and chromium.

**Nicol Prism**—An instrument for experiments in polarized light, consisting of a rhomb of clear calcite which has been bisected obliquely at a certain angle and had its two parts joined again with transparent cement, so that the ordinary ray produced by double refraction is totally reflected from the internal cemented surface, and the extraordinary ray (polarized) is alone transmitted.

**Nigged**—In stone masonry, hewed with a pick.

**Nigger Head**—A drum on the end of a rotating shaft around which hemp rope is wrapped in one or more circles and held taut for lifting or moving loads.

—A hard head.

—Rounded cobble stones.

**Nitre**—(See soda nitre.)

**Nodal Planes**—(optics) Planes perpendicular to the optical axis and passing through the two nodal points.

—**Points**—(aptics, photography) The two points on the optical axis which in theory represent the apices of the cones of rays incident on and emergent from the lens system. **Front Nodal Point**—The nodal point of incidence. **Rear Nodal Point**—The nodal point of emergence. Rays in the object space entering the lens in the direction of the front nodal point emerge in the image space parallel to their former direction, but as if

their source had been the rear nodal point.

—**Points**—Two points on the axis of a lens such that a ray entering the lens in the direction of one, leaves as if from the other and parallel to the original direction.

**Nodes**—In acoustics, the points, lines, or surfaces of a stationary wave system which have a zero amplitude.

—**Partial**—(See partial nodes.)

**Nodule**—A small roundish lump of some mineral or earth, as a nodule of ironstone.

**Noise**—Any undesired sound.

—**Audiogram**—In acoustics, a graphical record of the masking due to a given noise, as a function of the frequency of the masked tone.

**Nominal Gas Capacity**—The volume of the gas cell or cells of an aerostat under certain definite conditions of pressure and inflation.

**Non-Asphaltic Road Oil**—A non-hardening petroleum distillate used as a dust-laying oil.

**Non-Carrier**—Applicable to physical property and other assets of a railway neither used nor held for transportation service.

**Non-Conductor**—In electricity, a substance which offers great resistance to the passage of an electric current. Examples are: mica, rubber, glass.

**Non-Pressure Treatment**—In wood preservation, the process in which the preservative is applied to wood without pressure.

**Nonrigid Airship**—An airship whose form is maintained by the internal pressure in the gas bags and balloons.

**Non-Settleable Solids**—In sewage, suspended solids which will remain in suspension for an indefinite time (more than two hours), but which can be removed by proper laboratory filtering.

**Non-Tidal Current**—A horizontal

backward and forward movement of water brought about by causes independent of the tides such as fresh winds, fresh-water run-off, and differences in density and temperature.

**Non-Uniform Flow**—In hydraulics, open channel flow in which the cross section of the stream and, consequently, the velocity of flow, varies along the length of the stream. Non-uniform flow is always steady flow; that is, the flow past a given point does not vary with time.

**Non-Volatile Vehicle**—The liquid portion of a paint, excepting the thinner, which evaporates, and water.

**Norite**—A variety of gabbro consisting of plagioclase and orthorhombic pyroxene, usually hypersthene.

**Normal Depth**—(1) The distance between the water surface and the bed of a stream measured perpendicular to the stream bed; (2) the average depth; and (3) the neutral depth.

—**Erosion**—The type and rate of erosion appropriate to given natural conditions of rock or soil type, slope, vegetative cover, and climate, undisturbed by the activity of man.

—(or three-point) **Landing**—A landing in which a path tangential to the landing surface and the loss in flying speed are attained at approximately the instant of contact.

—**Load** (stress analysis)—(aeronautic) The load on that part of a wing assumed to be unaffected by tip losses or similar corrections. In any given case, it may be a basic, design, gross, net, or ultimate load, depending on the context.

—**Loop**—(aeronautic) A loop starting from normal flight and passing successively through a climb, inverted flight, dive, and back to normal flight.

- Pressure**—Standard pressure usually taken to be equal to that of a column of mercury 760 mm. in height. Approximately 14.7 pounds per square inch. (See atmosphere.)
- Solution**—A solution containing one gram-equivalent of the solute in one liter of solution.
- Solution**—Contains 1 gram molecular weight of dissolved substance divided by the hydrogen equivalent of the substance per liter of solution.
- Spin**—(aeronautic) A spin which is continued by reason of the voluntary position of the control surfaces, recovery from which can be effected within two turns by neutralizing or reversing all the controls. Sometimes called "controlled spin."
- Stress**—A stress which acts at right angles to a plane in the interior of a body.
- Temperature**—In laboratory investigations, 25° Centigrade, which is 77° Fahrenheit.
- Year**—In hydrology, a year of normal or average water supply.
- Normalizing**—Heating iron-base alloys above the critical temperature range, followed by cooling to below that range in still air at ordinary temperature.
- Nose-Down**—To depress the nose of an airplane in flight.
- Noseheavy**—The condition of an airplane in which the nose tends to sink when the longitudinal control is released in any given attitude of normal flight (cf. tailheavy).
- Nose-Over**—A colloquial expression referring to the accidental turning over of an airplane on its nose when landing.
- Nose-Up**—To elevate the nose of an airplane in flight.
- Notch**—(hydraulics) The opening in a dam or spillway for the passage of water.
- Nuisance**—(in relation to a polluted stream) A condition which is offensive to the sense of sight or smell.
- Number, Reynolds**—(aeronautic) (See Reynolds number.)
- Numerical Aperture**—Is the sine of half the angular aperture, used as a measure of the optical power of the objective.
- Nut**—A short prism of metal having a central hole which is threaded to receive a bolt or a screw.
- Lock**—A nut having some special provision to prevent turning.



- Oakum**—Hards or tow of flax or hemp, used for calking seams, stopping leaks.
- Obsidian (rock)**—Bright, clean, hard volcanic glass.
- Obsolescence**—An appraisal term defined as that factor of depreciation resulting from changes in the art, design, or process that makes a property less desirable and valuable for a continuity of use.
- Functional**—(See functional obsolescence.)
- Obsolete**—An appraisal term applied to the state of being no longer useful or desirable owing to changes in the art, design, or process, rather than to physical deterioration.
- Obstruction Light**—A red light designed to indicate the position and height of an object hazardous to the operation of aircraft.
- Obtuse Angle**—An angle whose value is greater than a right (90 degree) angle.
- Ocher**—A pulverulent iron oxide usually impure, used as a pigment; brown or yellow ochers consist of limonite or goethite, and red ocher of hematite.
- Yellow**—(See yellow ocher.)
- O.C.S.P.N.**—The "Official Code of Standardized Plant Names," issued by the American Joint Committee on Horticultural Nomenclature.
- Octant**—A variation of the aircraft sextant which measures angles up to 90 deg. Its artificial horizon is usually the bubble type.
- Octastyle**—In architecture, a facade having an 8-column treatment.\*
- Offset**—A short line run at right angles to a principal, or base line. To move over from a base line to an auxiliary line called an offset line.
- A side (horizontal) measurement of distance perpendicular to a line, usually a transit line.
- Line**—A line established parallel to the main survey line, and usually not far from it. Examples: A line on a sidewalk, 2 ft. from the established street line; a line parallel to the center line of a bridge, and 50 ft. from it.
- Offshore**—(See diagram near definition of beach.)
- Off-Take**—A diversion.
- Ogee**—A curve of the shape of an S, one convex and one concave surface.
- The reversed curve of the face of an overflow dam.
- Oil Asphalt**—Asphalt manufactured directly from petroleum.
- Bolt**—(See bolt oil.)
- Gas Tars**—Tars produced by cracking oil vapors at high temperatures in the manufacture of oil gas.
- Hardening**—The process of quenching red-hot steel in oil in order to harden it.
- Mat**—A thin surface course on a road made by the use of a liquid asphaltic material of low bitumen content.
- Road, Non-Asphaltic**—(See non-asphaltic road oil.)
- Shale**—A compact rock of sedimentary origin, with an ash content of more than 33 per cent and containing organic matter that yields oil when destructively distilled but not appreciably when extracted with ordinary solvents for petroleum.
- Tempering**—A process of plunging red-hot steel into oil to harden it.
- Oil-Tank Vent**—A large tube used to

conduct oil vapors from the engine to the oil tank.

**Oiling Machines** (track)—Power-operated railway machine usually mounted on some type of self-propelled car designed for the purpose of applying oil on rails below the ball and on track fastenings. Oil applied to resist rust and corrosion and prevent freezing of joints.

**Old Man**—An iron frame bent into the form of a U having hooks on the ends so that it can be hung to a bar or the flange of a girder and used to form a bearing for a ratchet drill or reamer.

**Oleo Gear**—(aeronautic) A type of oil-damping device that depends on the flow of oil through an orifice for its shock-absorbing effect in a landing gear.

—**Strut**—(aeronautic) A shock-absorbing telescopic strut in which an oleo gear is incorporated.

**Oligocene**—The second of the epochs into which the Tertiary period is at present ordinarily divided.

**Omnibus Bars**—In electricity, heavy bars of a conducting material which are directly connected to the poles of dynamo-electric machines, and receiving the entire output of the machine.

**Oolitic Limestone**—Those limestones consisting largely of minute spherical or ellipsoidal grains of calcium carbonate which resemble fish roe.

**Opacity**—The degree of obstruction to the transmission of visible light.

**Opal**—An oxide of quartz,  $\text{SiO}_2$ ,  $n\text{H}_2\text{O}$ . Some varieties of opal are: precious, fire-opal, hyalite, girasol, forcherite, hydrophane, etc.

**Open Caisson**—(See caisson, open.)

—**Fuse**—In electricity, a bare safety fuse. A link fuse.

—**Graded Aggregates**—(See dense and open graded aggregates.)

—In bituminous work, a graded aggregate with a limited proportion

of particles passing a No. 10 sieve and not more than 5 per cent passing a No. 200 sieve.

—**Hearth**—The hearth of a metallurgical furnace which is exposed to the direct action of the flame.

—**Process**—A process for the reduction of steel by the oxidation and removal of the impurities contained in a bath of metallic iron lying on the hearth of a regenerative furnace.

—**Tank Treatment**—In wood preservation, the process in which timber is immersed in hot oil, for various lengths of time, and then immediately in cold oil.

—**Web**—A web composed of a group of members instead of solid plates.

**Open-pit Quarry**—A quarry in which the opening is the full size of the excavation.

**Open-Spandrel Arch**—(See arch, open-spandrel.)

**Open-top Culvert**—A culvert with slots or openings in the top and placed close to the road surface for the purpose of intercepting surface water.

**Operating Expenses**—In railway use, the expenditures of a railway for furnishing transportation service, including expenditures for maintaining the carrier property used in service.

—**General**—The expenditures of a railway for general administration, accounting, law, real estate, claim, relief, pensions and expense not directly assignable to other phases of railway operating expenses.

—**Maintenance of Equipment**—The expenditures of a railway for maintenance, repairs, and depreciation of equipment and shop and power plant machinery.

—**Maintenance of Way and Structures**—The expenditures of a railway for maintenance, repairs and depreciation of property devoted to operations except equipment and shop and power plant machinery.

—**Miscellaneous Operations**—The ex-

- penditures of a railway for dining cars, hotels, restaurants, grain elevators, stock yards and other miscellaneous operations.
- Speed**—(aeronautic) The speed in level flight corresponding to 87.5 per cent of the rated speed of the engine.
- Waste**—In irrigation, the water wasted through spillways or otherwise discarded from an irrigation system after having been diverted into it.
- Ophicalcite**—(rock) Is the name given to rocks consisting of a mixture of white calcite and green serpentine.
- Ophitic**—A term applied to microscopic rock texture to designate a mass of longish interlacing crystals, the spaces between which have been filled with minerals of later crystallization.
- Optical Axis**—A prolongation of the line joining the nodal points of a lens. It passes through the centers of the spheres whose surfaces form the boundaries of the lens.
- Center**—(optics) That point on the optical axis intersected by a ray which emerges from the lens in a direction parallel to that in which it entered.
- (photography) See Principal Point.
- Optimum**—The most favorable for the results desired; as for instance, the optimum quantity of irrigation water, the optimum soil moisture, etc.
- Moisture Content**—In soil technology, this refers to that moisture content in per cent by weight of dry soil, which results in the least voids or greatest density when that soil is compacted.
- Order**—In architecture, an order consists of the column and entablature. The pedestal may or may not be included.\*
- Bill**—A form of bill used in ordering material from the manufacturers.
- Ordinate**—The vertical coordinate in a system of rectangular coordinates defining the position of a point.
- The perpendicular distance from a point on the tangent to a point on the curve.
- Ordovician**—The second of the periods comprised in the Paleozoic era, in the geological classification now generally used.
- Bridge**—A gantry crane used for handling ore at a blast furnace.
- Deposits**—A term applied to concentrations of economically valuable metalliferous minerals found in the earth's crust.
- Ore**—A mineral or association of minerals that may, under favorable circumstances, be worked commercially for the extraction of a metal.
- Bessemer**—(See Bessemer ore.)
- Orei**—A term applied in the Quincy quarries to Quincy granite which has been rendered valueless by the alteration of its aegirite particles.
- Organic**—The product of animal or vegetable life.
- Deposits**—Rocks and other deposits formed by organisms or their remains.
- Soils**—Soils composed mainly of organic material; the organic content being sufficient to dominate the soil characteristics.
- Oriel**—In architecture, a window projecting from a wall and supported by stones corbelled out from the wall.
- Orient**—To turn a map or plane-table sheet in a horizontal plane until the meridian of the map is parallel to the meridian on the ground. In this position all lines on the map have the same azimuths as the corresponding lines on the ground.
- (photography) To turn a photograph in a horizontal or vertical plane until the perspective view is in correct relation to the ground or to a map. See, also, Exterior Orientation.

—(transit) To turn the instrument so that the direction of the  $0^\circ$  line of its horizontal circle is parallel to the direction it had in the preceding, or in the initial, set-up.

**Orientation**—In architecture, the direction in which buildings are faced.\*

—Placement of objects or areas with respect to each other. Mostly the placement is in reference to a direction line.

**Orifice**—An opening through which water may flow.

—**Test**—(See low pressure orifice test.)

**Original Cost**—The actual original cost of a plant, including additions and improvements, but not including profits resulting from the sale of the completed plant.

**Oriskany Sandstone**—A sandstone occurring in the rocks of the Devonian age in the United States.

**Ornithopter**—A form of aircraft heavier than air, deriving its chief support and propelling force from flapping wings.

**Orogenic**—A term relating to the formation of mountains.

**Orogeny**—The process of mountain building.

**Orpiment**—An arsenic mineral having the formula  $As_2S_3$ , or sulphur 39 per cent and arsenic 61 per cent.

**Orthochromatic Film or Plate**—(photography) A plate or film in which the color sensitivity has been extended into the green and yellow. Such a plate or film is sensitive to violet, blue, green, and yellow light.

**Orthogneiss**—In petrology, a general term applied to gneisses derived from rocks of igneous origin.

**Oscillograph**—An instrument for recording the wave forms of an alternating current or voltage.

**Outage**—Applying generally to measurements of bituminous materials in tanks, and referring in inches and/or gallons at a definite tem-

perature (F.) to the space between the shell (of tank car, distributor, or storage tank) and top of bituminous material. (See innage.)

**Outcrop** (of rocks) Those places where the underlying bedrock comes to the surface of the ground and is exposed to view.



*Outcrop of limestone showing sharp angles of dip and extreme stratification*

**Outer Hip**—The hip at the outer end of one of the arms of a swing span of a bridge.

**Outfall**—In hydraulics, the point where water is discharged from a conduit; the mouth of drains and sewers.

—**Sewer**—A sewer which receives the sewage from the collecting system and conducts it to a point of final discharge or to a disposal plant.

**Outhaul Line**—(See grass rope.)

—**Rope**—The rope used on a cableway or overhead skidder for traveling the carriage outward from the hoist.

**Outlet**—Downstream opening or discharge end of a pipe, sewer, culvert or canal.

—**Channel**—In engineering, a waterway provided to collect and carry away the run-off discharged from terrace channels; usually called "terrace outlet channel."

**Outlook**—A look out; the view had by one looking out over a landscape, sea view, or other exceptional offscap.

- Output**—The production of a mill, plant, or company for a certain period.
- The energy given for work done.
- Outtrigger**—A beam or joist projecting from a structure, used to support a load at its end.
- Mooring-Cone**—The member, usually tubular, which supports the mooring cone at the bow of an airship; sometimes referred to as the "mooring spindle."
- Outside Caliper**—A caliper for measuring the outside diameter of a cylinder or tube.
- Loop**—(aeronautic) A loop starting from normal flight and passing successively through a dive, inverted flight, climb, and back to normal flight, the pilot being on the outside of the flight path.
- Outwash**—Drift carried by running water from a glacier and deposited beyond the marginal moraine.
- Oven, Belgian**—(See Belgian oven.)
- Breeze**—(See breeze oven.)
- Overall Efficiency** (of compressors)
- The product of the compression efficiency and the mechanical efficiency.
- Length**—The distance from the extreme front to the extreme rear of an aircraft, including the propeller and the tail unit.
- Overblown**—A term applied to Bessemer steel which has been blown too long and is overoxidized and hence inclined to be wild.
- Overburden**—Refers to the soil mantle, waste material, or other similar matter found directly above the deposit of rock or sand-gravel. The amount of this overburden has a direct economic effect upon the amount of material capable of being produced.
- Overdepth, Allowable** — (dredge work) Excavating to a depth greater than immediately required to make allowance for type of dredge, silting and economy of longer intervals between maintenance dredging.
- Overfall**—(hydraulics) The part of a dam or weir over which the water pours; the overpouring water.
- Dam**—(hydraulics) A dam constructed to allow water to overflow its crest.
- Overflow Stand**—A standpipe in which water rises and overflows at the hydraulic grade line.
- Streams**—In geology, these are the spillways from standing water bodies and as such include all effluents of lakes.
- Overhang**—(1) One-half the difference in span of any two main supporting surfaces of an airplane. The overhang is positive when the upper of the two main supporting surfaces has the larger span. (2) The distance from the outer strut attachment to the tip of a wing.
- Overhaul**—In engineering, the transportation of excavated material beyond certain specified limits, known as the free haul distance.
- Overhead**—A structure carrying a road over a railway or over another highway. An overpass.
- Charges**—In engineering economics, a term generally used to include only office expenses and general miscellaneous expenses, the latter being so general that they cannot be charged either against the office or field or shop, and are incurred in the maintenance of the business in general.
- Cost**—In economics, that part of the indirect cost not included in the unit costs.
- Girder**—A girder that is over the head—sometimes moving on an overhead track, as in a traveling crane.
- Overlap**—(photography) Amount by which one print overlaps the area covered by another. The overlap between aerial photographs in the same flight is distinguished as the "End Lap," and the overlap be-

- tween photographs in adjacent parallel flights is called the "Side Lap."
- Overload**—A load which produces intensities of stresses beyond the allowable unit stresses.
- Overlook**—A graded terrace often enclosed by a masonry retaining wall usually located on roadside or park areas where elevation or other favorable topographic conditions provide for an extensive view of a mountain, sea, or river or otherwise exceptional offscap.
- Overmelt**—To keep steel too long in a state of fusion.
- Overpass**—(See overhead.)
- Overshoot**—To fly beyond a designated mark or area, such as a landing field, while attempting to land on the mark or within the area.
- Overthrust**—The lateral thrusting of a mass of rock over or upon other rocks, along a thrust fault.
- Overtone**—In acoustics, an overtone is a partial having a frequency higher than that of the basic frequency.
- Overtopping**—(levee) Flood height exceeds elevation of top of levee.
- Overturning Moment**—The moment of the external forces tending to overturn a structure.
- Overwash Drift**—The material which is washed out from the front of a glacier.
- Overwinding**—The winding of one layer of rope over another on a drum.
- Ovolo**—In architecture, a molding of quarter-round section, as echinus.\*
- Oxalate Blasting Powder**—A powder composed of 71 per cent nitre, 14 per cent charcoal, and 15 per cent ammonium oxalate.
- Oxbow Lake**—A crescent-shaped lake formed in an abandoned river bend which has become separated from the main stream by a change in the course of the river.
- Oxidation**—A chemical union with oxygen.
- Oxidized Asphalt**—Asphalt which has had certain of its natural characteristics changed or modified by blowing air through it at an elevated temperature. For this reason it is often called blown asphalt. Oxidized asphalt has a higher melting point than asphalt of the same consistency produced only by evaporation or distillation of petroleum.
- Sewage**—Sewage in which the organic matter has been combined with oxygen and has become stable.
- Oxidizing Flame**—A welding flame having oxygen in excess of that required to produce a neutral flame.
- Oxygen Consumed**—A measurement of the relative amounts of oxygen obtained from potassium permanganate under controlled conditions by organic and inorganic matter present in sewage or waste.
- Ozocerite**—Waxlike hydrocarbon, yellow-brown to green in color; feels greasy.

# P

- Packing**—Any material used in a gland to make a tight joint around a valve stem, steam or pump piston rod or other similar part. Leather, rubber, or metal rings are used. Also the oiled waste for lubricating railway truck bearings.
- Block**—A small member, usually wood, used to secure the parts of a composite member in their proper relative positions.
- Diagram**—A drawing showing the arrangement or packing of the parts of a composite member or the disposition of several members meeting at a panel point. Refers generally to arranging truss members on pins in pin-connected structures.
- Pieces**—Short pieces inserted between two others which are riveted or bolted together to prevent their coming in contact with each other.
- Packsand**—A very fine-grained sandstone so loosely cemented by a slight calcareous cement as to be readily cut by a spade.
- Pahoehoe**—A term for lava which has a ropy smooth surface.
- Paint**—A mixture of pigment with vehicle, intended to be spread in thin coats for decoration or protection, or both.
- Patch**—Repairing or restoring small isolated areas in the surface of the metaled or paved portion of a road or street with a thin layer of bituminous mixture.
- Spraying Machine**—A device for applying paint by means of compressed air consisting of power unit, air compressor, paint containers, hose and spray gun.
- Palagonite**—In petrology, a term applied to altered basaltic glass, occurring interstitially, as amygdale fillings, or in tuffs.
- Paleozoic**—One of the grand divisions or eras of geologic time, preceding the Mesozoic era.
- Palimpsest Structure**—In petrology, a structure of metamorphic rocks due to the presence of remnants of the original texture of the rock.
- Palingenesis**—In petrology, the rebirth of a magma in situ by the fusion of pre-existing rocks such as granite, gneisses and schists.
- Palisade**—A line of bold cliffs, especially one showing basaltic columns.
- Palliative**—A short-lived dust layer.
- Palmer Truss**—Same as "Burr truss."
- Pancake Landing**—A landing in which the leveling-off process is carried out several feet above the ground, as a result of which the airplane settles rapidly on a steep flight path in a normal attitude.
- Slag**—A term applied to slag cooled in a machine similar to a pig casting machine.
- Panchromatic Film or Plate**—(photography) A plate or film in which the color sensitivity has been extended through the orange into the red. Such plate or film is sensitive to visible light of all colors.
- Panel**—A section of a structure between adjacent posts, columns, or beams.
- (aerostat)—(1) The unit piece of fabric of which the envelope or outer cover of an aerostat is made. (2) In rigid airships, the area bounded by two consecutive longitudinals and two consecutive transverses.
- (airplane)—A portion of an airplane wing constructed separately from the rest of the wing to which it is attached.
- Length**—The distance in either rectangular direction between centers of two columns of a panel.
- Point**—The point at which the axis

- of a principal web member intersects the axis of a chord of a truss.
- Rip**—A strip of fabric, inserted or fitted in the upper part of the envelope of a balloon or semirigid or nonrigid airship, which is torn or ripped open when immediate deflation is desired.
- Paneled Ceiling**—The ceiling of a flat slab in which approximately that portion of the area enclosed within the intersection of the two middle strips is reduced in thickness.
- Pantograph**—An instrument for copying maps, plans, etc., on any predetermined scale.
- Paper, Fish**—(See fish paper.)
- Spar**—A variety of calcite found in thin paper-like plates.
- Par or Par Value**—The par value of a bond is the amount payable at maturity. The par value of a stock is the nominal valuation stated on its face.
- Parabolic Formula**—Any formula having the form  $y^2=2px$ .
- Truss**—A bowstring truss having the upper chord joints lying in a parabola.
- Weir**—(hydraulics) A measuring weir, with a notch of parabolic shape so proportioned that the flow is proportional to the head.
- Parachute**—An umbrella-like device used to retard the descent of a falling body by offering resistance to its motion through the air.
- Flare**—A pyrotechnic device attached to a parachute and designed to illuminate a large area when released from an aircraft at an altitude.
- Harness**—(aeronautic) A combination of straps, buckles, and fastenings used to attach a parachute to the wearer.
- Pack**—A parachute and its container.
- Rigger**—A person who packs, repairs, and inspects parachutes.
- Vent**—A distendable opening in the apex of the canopy of a parachute designed to relieve excess pressure and to stabilize the parachute in descent.
- Paragenesis**—A general term for the order of formation of associated minerals in time succession, one after another.
- Paragneiss**—In petrology, a gneiss formed by the metamorphism of a sedimentary rock, such as Arkose; contrasted with orthogneiss.
- Paragonite**—A kind of mica corresponding to muscovite, but with sodium instead of potassium.
- Parallax**—The apparent displacement, or change in position, of the cross-hairs of a focusing telescope with reference to the image of an object, as the eye is moved from side to side, when the focus of the eye-piece or objective is imperfect.
- (astronomy) The difference in direction of a heavenly body as seen from some point on the earth's surface and as seen from some other conventional point, as the center of the earth.
- Age**—The lag in the response of the tide to the changing distance of the moon from the earth.
- Stereoscopic**—The apparent displacement of corresponding image points on two overlapping photographs.
- Parallel**—A condition of being everywhere equidistant, not intersecting. Applied to lines and planes.
- Parapet**—A wall or barrier on the edge of an elevated structure for protection or ornament. The portion of a wall that extends above the roof.
- A wall or rampart breast high.
- The wall on the top of an abutment extending from the bridge seat to the under side of the bridge floor and designed to hold the backfill.
- Parasite Drag**—That portion of the

drag of an aircraft exclusive of the induced drag of the wings.

**Parasol Monoplane**—A monoplane in which the wing is above the fuselage.

**Park**—Usually includes all public parks, parkways, beaches and open spaces and also the entrances and approaches thereto.

**Parker Truss**—A name sometimes used for the Pratt truss when the upper chord is polygonal.

**Parkway**—A highway term referring to a freeway with recreational facilities, parks, and scenic areas provided by the acquisition and development of an appreciable though variable width of right-of-way.

**Parshall Measuring Flume**—A device developed by the U. S. Department of Agriculture and the Colorado Experiment Station, at Fort Collins, Colo., under the direction of Ralph L. Parshall, to measure the flow of water; formerly called the "Improved Venturi Flume."

**Part Circle**—An arch segment used for culvert purposes at intersections where headroom is limited.

**Partial**—In acoustics, a partial is a component of a complex tone. Its frequency may be either higher or lower than that of the basic frequency and may or may not bear an integral relation to the basic frequency.

—**Nodes**—In acoustics, partial nodes are the points, lines or surfaces of a stationary wave system which have a minimum amplitude.

**Participating Bond**—A bond which, in addition to being secured by a mortgage on certain property, provides that the owner shall participate in profits which may accrue to the issuing corporation, during periods of prosperity.

**Particle Velocity**—In acoustics, in a sound wave is the instantaneous velocity of a given infinitesimal

part of the medium, with reference to the medium as a whole, due to the passage of the sound wave.

**Parting**—A small joint in coal or rock, or a layer of rock in a coal seam.

**Pascal's Law**—Pressure exerted at any point upon a confined liquid is transmitted undiminished in all directions.

**Pass**—In steel manufacture, the passage of any piece of metal through the rolls of a rolling mill as an ingot through the blooming rolls; or the openings in the various rolls or roll trains, which give the hot metal the desired shape.

—A defile through rough terrain.

**Passenger, Suburban or Commuter**—A short distance traveler rarely requiring auxiliary and incidental service.

—**Through**—The long distance traveler usually requiring auxiliary and incidental service.

**Passive Transducer**—In acoustics, one in which the power supplied to the second system is obtained exclusively from the power available from the first system.

**Patch**—A strengthened or reinforced flap of fabric of special shape and construction cemented to the envelope or gas cell of an aerostat. It usually forms an anchorage by which some portion of the structure may be attached to the envelope, or by which the positioning lines controlling the gas cell may be attached to the cell.

**Patching**—Repairing or restoring small isolated surface areas.

**Patent Hammer**—A double-faced hammer so formed as to hold at each face a set of wide thin chisels for giving a finish to a stone surface.

**Path, Flight**—(aeronautic) (See flight path.)

**Pattern**—A model made of wood to duplicate the desired object. It is used to form the cavity in a mold

into which the molten metal is afterward poured.

—**Interference**—(See interference pattern.)

**Patrol Maintenance**—That where a gang of men or an individual is responsible for the routine maintenance of a definite mileage of roads or streets.



*Photo courtesy Armco Culvert Mfrs. Assn.  
Paved invert on corrugated pipe*

**Paved Invert**—Lower segment of a corrugated metal pipe provided with a relatively smooth bituminous material which completely fills the corrugations, intended to give resistance to scour and corrosion.



*Photo courtesy National Paving Brick Assn.  
Brick paving work showing kettles, tandem roller, gravity roll conveyors, droppers at work, and trussed cushion template*

**Paving Brick**—A hard burned vitrified clay unit for use in pavements with physical qualities that will meet the requirements of standard

specifications; such as those of the American Society for Testing Material and the Federal Specifications Executive Committee.

**Pavement**—The wearing course of the roadway or footway, when constructed with a cement or bituminous binder, or composed of bricks, blocks of slabs, together with any cushion or "binder" course.

—In bituminous work, any surface with a final thickness greater than 1 inch.



*Photo courtesy U. S. Bureau of Public Roads  
Concrete pavement with good sight distance*

**Paver**—(See paving brick.)

—A large powered mixer, either concrete or bituminous, that travels on wheels or crawler treads beside or on the subgrade or surface of a road or street, and which mixes and deposits the mixture in place on the road.

**Pay Item**—Units in a contract which are covered by specifications and listed as separate units for payment.

—**Load**—That part of the useful load from which revenue is derived, viz., passengers and freight.

**Pea Gravel**—Clean gravel, the particles of which equal peas in size.

**Peak Load**—In electricity, that load carried by an electrical apparatus when working at full rated capacity.

—**Sound Pressure**—In acoustics, the peak sound pressure for any speci-

fied time interval is the maximum absolute value of the instantaneous sound pressure in that interval. The unit is the dyne per square centimeter.

**Peat**—Is the partly carbonized organic residuum produced by an arrest in the decomposition of roots, trunks of trees, twigs, seeds, shrubs, mosses, and other vegetation covered or saturated with water. It contains a large proportion of the carbon of the original vegetable matter. It is usually acidic and it contains much less inorganic than organic matter. It also consists of about 10 per cent solid matter and 90 per cent water. The specific gravity ranges from 0.1 to 1.06. It is excellent for loosening soil and retaining moisture therein.

—**Bog**—A bog containing peat; an accumulation of peat.

—**Soil**—Soil composed predominantly of organic material, considerably decomposed but highly fibrous, with easily recognizable plant remains.

**Peaty Humus**—Humus formed from vegetable material, decomposed in the absence of oxygen; it has a high proportion of both carbon and nitrogen. It is essentially an acid product, and even when aerated and supplied with mineral materials will oxidize with extreme slowness.

**Pebble Lime**—The natural quicklime product resulting from the burning in a rotary kiln of a limestone which is selected as to size and quality.

**Pebbles**—Rock fragments of small or moderate size which have been more or less rounded by erosional processes.

**Pedestal**—An upright compression member whose height does not exceed 3 times its least lateral dimension.

—A footing for a tower post.

—A bridge shoe.

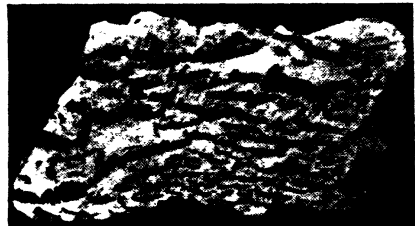
—**Footing**—A column footing projecting less than one-half its depth from the faces of the column on any side and having a depth not more than three times its least width.

—**Strut**—A strut connecting and bracing two pedestals.

**Pedestals**—Or pedestal blocks, are stone blocks on top of an abutment coping; the pedestal blocks receive the weight of the bridge, and are often called "bridge seats."

**Pedestrian**—Any person afoot.

**Pediment**—In Classic architecture, a triangular piece of wall above the entablature and enclosed in a triangular cornice (wall + cornice.)\*



*Photo courtesy Ward's Natural Science Est.  
Pegmatite*

**Pedologist**—One versed in pedology, or engaged in the study of the soil; a soil scientist.

**Pedology**—That branch of science which deals with the soil, its origin from the rocks of the earth's crust, its physical and chemical properties, and its relationship to plant and animal life.

**Peg Adjustment**—A method of adjusting a spirit-leveling instrument, to make the line of sight parallel to the axis of the level tube. The difference in elevation between two pegs, or turning points, is determined by direct leveling, first with the instrument set up near one of these points; and second, with the instrument set up near the other point. This causes the error of ad-

justment to have its maximum possible effect on the observed difference in elevation, since the lengths of the foresights and backsights have been made as unequal as possible. The discrepancy between the two results is a measure of the error of adjustment, and forms the basis for correcting it.

**Pegmatite**—A very coarse granite occurring in irregular dikes or lenses in granites and some other rocks.

**Pegram Truss**—A form of truss having the panel points of the upper chord lying in the arc of a circle and inclined web members.

**Pele's Hair**—A fibrous, basaltic glass from the Hawaiian Islands, named after a local goddess.

**Pelite**—In general, any sedimentary rock, indurated or not, formed of clay.

**Pendant, Sighting**—A vertical wire on the center line and forward of the control car of an airship, used as a guide in steering and to assist in determining the direction of the wind.

**Pendentives**—In architecture, triangular curved areas connecting a square base with a circular top, as the masonry supports springing from four piers at the corners of a square and connecting to a circular dome.\*

**Peneplain**—In geology, a nearly flat or broadly undulating land surface produced by normal subaerial erosion.

**Penetration**—The consistency of a bituminous material expressed as the distance that a standard needle vertically penetrates a sample of the material under known conditions of loading, time and temperature. Where the conditions of test are not specifically mentioned, the load, time and temperature are understood to be 100 g., 5 seconds, and 25° C. (77° F.), respectively, and the units of pene-

tration to indicate hundredths of a centimeter.

—In wood preservation, the depth to which the preservative enters wood through both lateral and end surfaces.

—Permeation or infiltration.

—**Construction**—The general method of road or street construction described for bituminous macadam. It also applies, however, to similar use of emulsified asphalt and cut-back asphalt or fluxed tar with a denser graded mineral aggregate in which the void spaces are much smaller than for bituminous macadam. Smaller voids are necessary for the liquid or fluid bituminous products which would otherwise drain through to the bottom of the course.



*Photo courtesy The Asphalt Institute  
Asphalt penetration macadam surface, showing texture*

—**Heat**—(See heat penetration.)

—**Weld**—(See weld penetration.)

**Pennsylvania Truss**—A Petit truss with an inclined chord.

**Pennsylvanian**—The second of the three epochs comprised in the Carboniferous period, in the classification generally used by American geologists.

**Penstock**—(hydraulics) A closed conduit for supplying water under pressure to a waterwheel or turbine.

**Pentacalcium Trialuminate**—In cement technology, an alumina compound which may form in small amounts on Portland cement. Commonly abbreviated to  $5\text{CaO} \cdot 3\text{Al}_2\text{O}_3$  or simply  $\text{C}_5\text{A}_3$ .

- Peperino**—A kind of volcanic rock, formed by the cementing together of volcanic sand, cinders, scoria, etc.
- Peptizing Agent**—A material which encourages the formation of a colloidal dispersion and contributes to its stability when formed.
- Perched Water Table**—In hydrology, the upper surface of a body of free ground-water in a zone of saturation separated by unsaturated material from an underlying body of ground-water in a differing zone of saturation.
- Percolating Filter**—(See trickling filter.)
- Percolation**—The act of water descending through the earth from the ground surface.
- The flow or trickling of a liquid downward through the relatively coarse interstices of a substance. The liquid usually does not fill the pores of the medium.
- Perforated Plate Screen**—Size separation unit made of perforated plates.
- Perforations**—Circular or other shaped openings through a plate or material, usually metal.
- Performance Bond**—The security furnished by the contractor to guarantee the completion of the work in accordance with the terms of the contract.
- Performance-Type Glider**—A glider having a high degree of aerodynamic refinement and low minimum sinking speed.
- Pericline**—A variety of albite feldspar.
- Peridotite**—A granular igneous rock composed essentially of olivine, generally with some form of pyroxene, and with or without hornblende, biotite, garnet, etc.
- Perigean Range**—The range of tide at the time of perigean tides.
- Tides**—The tides with increased range occurring when the moon is in perigee.
- Perigee**—The position of the moon closest to the earth in its elliptical orbit around the earth.
- Perihelion**—The position of the earth closest to the sun in its elliptical orbit around the sun.
- Period**—The unit of geologic time of the second rank; a division of an era.
- In acoustics, the time required for one cycle of a periodic quantity is the period. The unit is the second.
  - Natural**—(See natural period.)
  - Of Vibration**—The time required for the vibrating particle to make one complete movement back and forth.
- Periodic Law**—The physical and chemical properties of the elements are functions of their atomic numbers, and most of these properties are periodic functions.
- Peripheral Pump**—A pump having an impeller which develops head by recirculating the liquid through a series of rotating vanes.
- Peripteral**—In architecture, a structure having columns on all sides arranged as colonnades.\*
- Peristyle**—In architecture, a continued colonnade surrounding a court.\*
- Perkrite**—A general term for rocks composed essentially of pyroxenes or amphiboles, or of members of both groups.
- Perlite**—In petrology, a glassy volcanic rock of rhyolitic composition with concentric, shelly texture and usually with a notable percentage of water.
- Permanent Dam**—A dam made of concrete or masonry.
- Set**—The difference or change in length of an unruptured bar or section after a stress exceeding the yield point has been relieved.
  - Strip**—In soil erosion work, a relatively narrow or small area of land kept in permanent cover for the purpose of retarding run-off and checking erosion, by wind or water.

—**Water**—A watering place which supplies water throughout the year.

**Permeability**—In wood preservation, the degree to which wood permits the injection of preservatives.

—The degree to which any material permits the injection of liquids or gases.

—(aeronautic)—The measure of the rate of diffusion of a gas per unit area of any material used in the construction of a gas container.

—Penetrability.

• **Permian**—The last of the three epochs comprised in the Carboniferous period, in the classification generally used.

**Permissible Velocity**—In hydraulics, the highest velocity at which water may be carried safely in a canal or other conduit. The highest velocity that can exist through a substantial length of a conduit and not cause scour of the channel.

**Perthite**—A variety of feldspar consisting of closely interlaminated orthoclase or microcline and albite feldspars.

**Pervious Bed**—A bed or stratum that contains voids through which liquids will move under ordinary pressure.

—**Stratification**—Chiefly found in hydraulic fills. A stratum of boulders or gravel extending across fill of varying degrees of porosity.

**Pests**—Insects such as plant lice, borers, beetles, worms that eat at and tend to destroy vegetation.

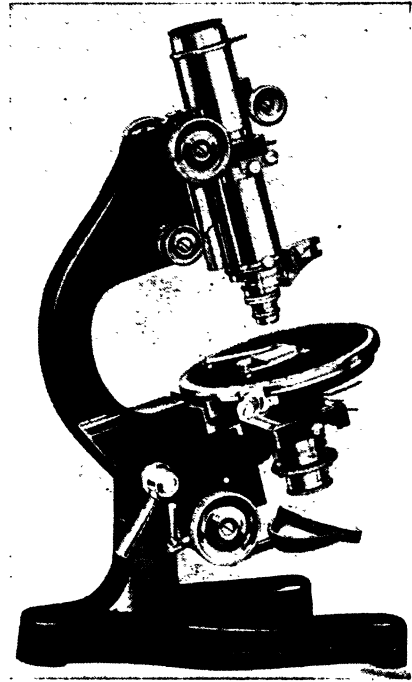
**Petit Truss**—A modified form of the Pratt truss having subdiagonals.

**Petrogenesis**—In geology, commonly applied to the study of igneous rocks.

**Petrographic Microscope**—The same as polarizing microscope.

**Petrography**—That branch of petrology which treats of rocks as mineral aggregates aside from their geologic relations, and is

studied mainly by thin sections of rock.



*Petrographic microscope*

**Petroleum**—Liquid bitumen occurring in nature.

—**Asphalt**—Asphalt refined directly from petroleum. Most petroleum asphalt used in highway work is produced by merely distilling off the gasoline, kerosene and other oils which hold the asphalt in solution. Asphalt is one of the constituents of asphaltic petroleum, which are refined primarily for its recovery.

—**Crude**—(See crude petroleum.)

—**Crude, Topped**—(See topped crude petroleum.)

—**Naphtha**—(See naphtha, petroleum.)

—**Topped**—(See topped petroleum.)

**Petrolite**—An explosive mixture of nitre, lignite coal, wood pulp, coke-dust, and sulphur.

**Petrology**—The science of rocks,

treating of their origin, construction, etc., from all aspects and in all relations; lithology.

**Phacolith**—A lenticular mass of igneous rock intruded between adjacent strata in the apex of a fold.

**Phaneritic**—Textures in igneous rocks which are plain to the unaided eye.

**Phase**—A crystalline or liquid material of definite composition, physically distinct and homogeneous.

—A variation of equal value.

—(triangulation) Error in apparent horizontal direction of a signal due to unequal or one-sided illumination of the signal.

—**Age**—(in tidal work) The phase age; generally ascribed to the effects of friction, is the lag in the response of the tide to the corresponding phases of the moon. It usually amounts to a day or two.

—**Diagram**—A conventional graphic method for representing the results of study on phase equilibria.

—**Equilibria**—A term used in physical chemistry to indicate the systematic study of the phases that may exist in equilibrium with any given composition and temperature.

**Phenocryst**—A porphyritic crystal; one of the relatively large and ordinarily conspicuous crystals of the earliest generation in a porphyritic igneous rock.

**Phlogopite**—A magnesium mica, near biotite in composition, but containing little iron.

**Phonetic Speech Power**—In acoustics, the phonetic speech power is the maximum value of the average speech power, for 0.01 second intervals, of a vowel or consonant sound.

**Phosphate Rock**—A sedimentary rock composed chiefly of calcium phosphate along with various impurities, such as clay and lime. It occurs in beds, irregular masses, or as concretionary nodules in limestone or sand.

**Photoelectric Cell**—An electric cell

actuated by a source of light. The intensity of the current generated is proportional to the intensity of the beam.

**Photogoniometer** — (photographic mapping) An instrument for obtaining the direction of a ray from the nodal point of the camera lens to the image of any point on the photograph, by measuring the horizontal and vertical angles with reference to two perpendicular planes.

**Photogrammetry**—The art of making surveys or measurements by the aid of photography. Methods utilizing horizontal, vertical, and oblique views are in use, with and without the aid of the stereoscopic principle. See, also, Stereophotogrammetry.

**Photograph**—A positive or negative picture made by a camera on plate, film, or paper, or other medium.

—**Horizontal**—Photograph made with the camera axis horizontal.

—**Multiple**—Photograph made by means of a multiple-lens camera, the axes of the lenses of the different chambers being symmetrically arranged about a vertical axis so as to cover a wide field at simultaneous exposure in all chambers. A combined photograph may be formed by projecting the oblique views into a plane perpendicular to the axis of the camera unit and then mounting all views in such relation to one another that the equivalent of a very wide-angle single-lens photograph results.

—**Oblique**—Photograph made with the camera axis inclined intentionally at a comparatively large angle to the vertical.

—**Panoramic**—Photograph made by a ground camera mounted on a tripod and swung in a horizontal plane so as to give a continuous, wide-angle view. In some cases, the lens, rather than the camera itself, is the moving part.

	Temperature		Temperature
A	1436	1	1345
B'	1455	2	1170
B	1475	3	1415
C	2065	4	1335
D	1535	5	1265
E	1395	6	1310
F	1400	7	1380
G	1590	8	1415
H	1700	9	1512
I	1810	11	1475
J	1610	12	1505
L	1359	13	1380
M	1299	14	1335
N	1385	15	1335
O	1516	16	1455
P	1547	17	1470
Q	1552	18	1900
R	1512	19	1390
S	1545	20	1430
T	1350		

The components are  $\text{CaO}$ ,  $\text{Al}_2\text{O}_3$  and  $\text{SiO}_2$ .

The binary systems,  $\text{CaO-SiO}_2$ ,  $\text{SiO}_2\text{-Al}_2\text{O}_3$  and  $\text{CaO-Al}_2\text{O}_3$  are represented on the sides of the triangle.

The dotted lines are the tie-lines joining compounds which represent binary systems.

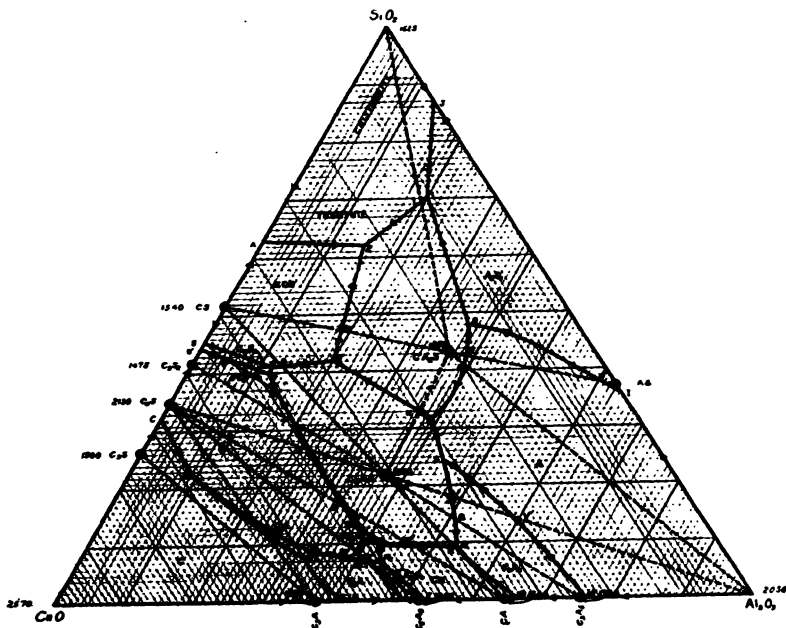
The heavy solid lines are boundary curves.

Thus the field within which  $\text{C}_3\text{S}$  appears as a primary phase is shown by the boundary curves 18-16-17.

The compound  $\text{C}_3\text{A}$ , lying outside of the field of primary crystallization of  $\text{C}_3\text{A}$  (D-17-16-15-E) is said to melt incongruently. At the temperature of liquid formation it is seen to dissociate to  $\text{CaO}$  (the primary phase) and liquid.

Arrows point in the direction of falling temperatures, towards the eutectics.

Melting temperatures are given in degrees C.



Equilibrium diagram of the ternary system,  $\text{CaO-Al}_2\text{O}_3\text{-SiO}_2$ . (Rankin & Wright)

- Plane**—The plane in the camera in which the plate or film is held. Also called Image Plane. It is not exactly the primary focal plane of the lens, but is a plane placed so as to secure the best balance of sharp focus on all parts of the plate or film.
- Vertical**—Photograph made with the camera axis vertical, or as nearly vertical as is possible in an airplane. A so-called vertical photograph can be made truly vertical only by rectification by means of ground control.
- Photographic Nadir**—See Plate Nadir Point; Nadir.
- Photomicrograph**—An enlarged or macroscopic photograph of a microscopic object, taken by attaching a camera to a microscope.
- Photo-Theodolite**—(terrestrial photographic mapping) A combination of a camera and a theodolite mounted on a tripod.
- Phreatic Water**—In ground water technology, that part of the subsurface water which is in the zone of saturation is called "ground water" or "phreatic water."
- Phugoid Oscillation**—A long-period oscillation characteristic of the disturbed longitudinal motion of an aircraft.
- Phyllite**—(rock) Is applied to a group of rocks associated with slate. The name means "leaf stone," because of the well-defined cleavage. Phyllite usually contains larger amounts of mica than the normal slates.
- Pickling**—The treatment of iron or steel with dilute acids for the purpose of obtaining a clean surface by removing the scale (oxide).
- Picture Drawing**—A general drawing attempting to show as a picture the actual way a structure would look.
- Pier**—A structure at an angle with the shore line of a body of water, providing docking space on both sides for vessels to receive and discharge cargo, passengers and supplies. (See wharf.)
- A substructural support, other than an abutment, used to transmit superstructure loads to footings and foundations.
- Fender**—Any construction adjacent to a wharf, pier, slipwall or other structure to prevent contact and damage to vessel or structure.
- Head Line**—A line in a harbor defining the channelward limit of structures. Such lines are established by the Secretary of War; however, state and municipal authorities, under their police powers, may establish pierhead lines shoreward of those established by the Secretary of War. (See bulkhead line.)
- Piezometer**—(hydraulics) An instrument for measuring pressure head of flowing water, usually consisting of a small-sized pipe tapped into the side of a closed or open conduit and flush with the inside connected with a pressure gage, mercury or water column, or other device for indicating pressure head.
- Pig Iron**—Cast iron usually produced by smelting iron ores in the blast furnace. It may have been cast into pigs or held in a molten condition for charging into a steel-making furnace.
- Pigment**—The fine solid particles used in the preparation of paint, and substantially insoluble in the vehicle.  
(Asphaltic materials are not pigments except when they contain substances substantially insoluble in the vehicle in which they are used.)
- Pig-Washing**—A process of refining or removing much of the phosphorous and silicon, in which the molten pig iron is treated with fused oxides of iron (and in some cases is mixed with oxides of manganese) in a reverberatory furnace.
- Pilaster**—In architecture, an engaged rectangular support of slight pro-

- jection and usually treated in the same manner as the order with which it is used.\*
- A wall projection resembling a column.
  - Pile**—A member usually driven or jetted into the ground and deriving its support from the underlying strata, and by the friction of the ground on its surface. The usual functions of a pile are: (a) To carry a superimposed load; (b) To compact the surrounding ground; (c) To form a wall to exclude water and soft material, or to resist the lateral pressure of adjacent ground.
  - Batter**—(See batter pile.)
  - Bearing**—One used to carry a superimposed load.
  - Butt of Pile**—The larger end of a pile.
  - Cap**—A metal, rope or wood hood placed over the head of a pile to protect it while driving.
  - A timber or concrete beam or steel channel or beam across the tops of a row of piles.
  - Disc**—(See disc pile.)
  - Driver**—A framework for driving piles by the continued dropping of a heavy weight.
  - Foot of**—The lower end of a pile.
  - Head of**—The upper end of a pile.
  - Permeable**—(See dike, permeable pile.)
  - Screw**—One driven by rotary movement instead of by impact and having a broad bladed screw attached to its foot to bore its way into the ground and also to provide a large bearing area.
  - Sheet**—(See sheet pile.)
  - Shoe**—A steel form, used in pile driving, shaped to fit over the point of a pile, to assist in the driving.
  - Test**—Pile driven to determine penetration and bearing capacity.
  - Tip of**—The smaller end of a pile.
  - Piles, Anchor**—Piles driven on the land side of a bulkhead or pier to which the bulkhead or pier is anchored or tied by rods, cables, chains or other devices.
  - Cluster or Fender**—Two or more piles driven and lashed together at the top for the purpose of controlling the position of water craft at bridges and piers.
  - Hurdle Dike**—Clusters of two to four piles, driven alternately to right and left of center line of dike. Top of clusters about at high water. Clusters tied to horizontal pile about five feet below top.
  - Premolded**—(See premolded concrete piles.)
  - Pillar**—A post or column.
  - Pilot**—One who operates the controls of an aircraft in flight.
  - Automatic**—(See automatic pilot.)
  - Balloon**—A small balloon sent up to show the direction and speed of the wind.
  - Balloon**—(See balloon, pilot.)
  - Nut**—A round nut, having one end tapering, which is screwed on a pin in order that it may be pushed through the eyes of the several eye-bars and other members meeting at a panel point. After the pin is in place, the pilot nut is removed and a Lomas nut is screwed on in its place.
  - Parachute**—A small auxiliary parachute attached to the apex of the main parachute, designed to pull the latter out of its pack when the rip cord is pulled.
  - Plane**—(aeronautic) An auxiliary airfoil pivoted near the leading edge of a main airfoil and free to take up a position in line with the wind.
  - Punch**—A machine punch in which the cutting tool is provided with a small central plug which fits into a hole in the material and acts as a guide for punching the larger hole.
  - Pin**—A round bar of steel used for connecting members of a truss. Also any round bar which fills a hole.

- A bar of wood or metal used to hold two or more pieces together by passing through a hole in each of them.
- Clevis**—A pin used to connect a clevis with a plate.
- Drift**—(See drift pin.)
- End**—A truss pin at the end of a span connecting the truss to the shoe.
- Frost**—(See frost pin.)
- Metal**—The metal called for in the specifications, from which pins may be made.
- Plate**—(See plate, pin.)
- Pin-bolt**—A bridge pin having a head and a nut.
- Pin-Connected Truss**—Any truss having its main members joined by pins.
- Pinhole**—A hole in a member through which the pin passes and connects with other members.
- Pinner**—In stone masonry, a spall or small stone used to wedge up a stone and give it better bearing.
- Pipe, Cast Iron** (centrifugally cast)—A pipe made from pig iron, cast in a revolving water-cooled mold.
- Cast Iron** (sand cast)—A pipe made of pig iron, cast in a cylindrical sand mold with a round central core.
- Continuous Stave**—A wood pipe built of staves milled to radial planes and correct curvatures for the interior and exterior of the pipe.
- Cross**—A branch casting provided with connections on four sides at right angles.
- Drop**—The vertical line of pipe in a well through which the liquid is discharged.
- Intake**—A line of pipe conveying water by gravity from a source of supply to an intake well.
- Line**—A line of pipe through which fluids travel.
- Rail**—A handrail, used on bridges, composed of wrought-iron pipe and fittings.
- Service**—A line through which fluids are distributed to points of actual use as distinguished from suction lines and discharge lines to tanks or reservoirs.
- Suction**—A line of pipe through which a pump draws its supply.
- Offset**—A casting in the form of a reverse curve, designed for the continuation of a line of pipe in a line parallel to its beginning.
- Pipeclay**—Masses of fine clay, generally of lenticular form, found embedded in the hydraulic gravel banks. (See ball clay.)
- Piped Rail**—A railroad rail in which the sides of the shrinkage cavity formed in the ingot are closely pressed together in the web of the rail but not welded.
- Piping**—In steel manufacture, the formation of a cavity in the upper interior of an ingot, caused by shrinkage of the liquid metal when solidifying.
- Conducting a pipe to a place.
- Pisolite**—A term referring to the individual concretions making up a pisolitic rock, as a bauxite.
- Pit**—Generally, a glacial deposit of gravel or sand or both, or a marl or caliche deposit, from which the overburden has been removed.
- A small corroded spot from which the corrosion has been removed.
- An open excavation relatively deep.
- Test**—(See test pit.)
- Pitch**—The slope of a roof.
- The distance from center to center of rivets.
- The degrees of descent of a declivity.
- A residuum in tar distillation. (See pitches.)
- In architecture; the ratio of the rise to the span.
- An angular displacement about an axis parallel to the lateral axis of an aircraft.
- Angle of**—(See angle of pitch.)
- Hard**—Pitch showing a penetration of not more than 10.
- (or **pitching**) **Indicator**—An instrument for indicating the existence

and approximate magnitude of the angular velocity about the lateral axis of an aircraft.

—**Of a Propeller** — **EFFECTIVE PITCH**—The distance an aircraft advances along its flight path for one revolution of the propeller.

**GEOMETRICAL PITCH**—The distance an element of a propeller would advance in one revolution if it were moving along a helix having an angle equal to its blade angle.

**ZERO-THRUST PITCH** — The distance a propeller would have to advance in one revolution to give no thrust. Also called "experimental mean pitch."

—**Pocket**—A well-defined opening between rings of annular growth, usually containing, or which has contained, more or less pitch, either solid or liquid.

—**Ratio** (propeller) — (aeronautic) The ratio of the pitch to the diameter.

—**Soft**—Pitch showing a penetration of more than 10.

—**Speed**—(aeronautic) The product of the mean geometrical pitch and the number of revolutions of the propeller in unit time.

—**Straight Run**—A pitch run to the consistency desired, in the initial process of distillation, without subsequent refining or fluxing.

—**Streak**—A well-defined accumulation of pitch in a more or less regular streak.

**Pitched**—Having the arris clearly defined by a line beyond which the rock is cut away by the pitching chisel so as to make approximately true edges.

**Pitched-face** — In stone masonry work, a face roughly dressed with a pitching chisel.

**Pitches**—Solid residues produced by the evaporation or distillation of bitumens, the term being usually applied to residues obtained from tars.

**Pitching**—(aeronautic) Angular motion about the lateral axis.

**Pitch-line** — A well-defined, straight line cut along the edge of a quarry-faced stone, but not as wide as a chisel draft.

**Pitchstone**—(rock) A variety of obsidian in which the luster, instead of being bright and glossy, is duller and the rock appears resinous or pitch-like.

**Pith**—In the case of wood, the small soft core occurring in the structural center.

**Pitot Tube**—A device for observing the velocity head of flowing water consisting essentially of an orifice held up stream in a prism of flowing water and connected with a tube by which the rise of water above the water surface may be observed. It may be constructed with an up-stream and a down-stream orifice and two water columns, the difference of water levels being an index of the velocity head.

—(aeronautic)—A cylindrical tube with an open end pointed upstream, used in measuring impact pressure.

**Pitot-Static Tube**—(aeronautic) A parallel or coaxial combination of a pitot and a static tube. The difference between the impact pressure and the static pressure is a function of the velocity of flow past the tube.

**Pitot-Venturi Tube**—A combination of a pitot and a venturi tube.

**Pitting**—Localized corrosion occurring in spots which frequently penetrate the entire sheet of metal.

**Pivot Span**—A span in a bridge that revolves; also called "draw-span," and "swing-span."

**Place Measurement** — (dredge work) Excavation measured by sounding a dredged cut before and after removal of materials.

**Placer Diggings**—Areas where placer mining has overturned or removed

the soil and left a rough, eroded, and scarred surface of little or no agricultural value.

**Plagioclase**—A term applied to all those feldspars that are not potash feldspars.

**Plain or Untreated Bed**—(for paving brick) This is composed of plain sand, stone or slag screenings, or other suitable granular mixture.

—**Concrete**—Concrete without metal reinforcement, or reinforced only for shrinkage or temperature changes.

**Plan**—The general layout of a structure; the horizontal projection of an object or structure. A drawing furnished for guidance of work.

—A long term scheme of operation resulting from the efforts of what might be termed an institutional mind. (See planning.)

—**Form, Developed**—(aeronautic) The plan of an airfoil as drawn with the chord lines at each section rotated about the airfoil axis into a plane parallel to the plane of projection and with the airfoil axis rotated or developed and projected into the plane of projection.

—**Form, Projected**—(aeronautic) The contour as viewed from above.

**Planation**—The bringing of the surface of the earth or any portion of it to level or plane condition by natural or artificial means; especially the complex process by which a stream develops its flood plain.

**Plane**—A flat surface.

—(or hydroplane)—To move through the water at such a speed that the support derived is due to hydrodynamic and aerodynamic rather than to hydrostatic forces.

—**Of Gravity**—Any vertical plane passing through the center of gravity of a body.

—**Of Symmetry**—A plane about which the parts of a figure or a body are symmetrically disposed.

**Planer**—A machine tool for cutting a flat face on metal.

—A machine of the grader type fitted with a series of blades for smoothing a road surface or spreading materials smoothly on the surface.

**Planes, Fill**—(See fill planes.)

**Plane Surveying**—Surveying in which all measurements are either made or reduced parallel to a horizontal or vertical plane.

**Plane-table**—A surveying instrument which consists of a table or board supported by a tripod, and an alidade with telescope placed thereon. The edge of the alidade and the axis of the telescope are parallel. Drawing paper is always pinned onto the board.

**Planetesimal Hypothesis**—The hypothesis that the earth, and the other planets, were formed by the collision and coalescence of planetesimals and have never been wholly molten.

**Planimeter**—An instrument for measuring the area of any plane figure by passing a tracer around the bounding plane.

**Planimetric Map**—A map showing the natural or cultural features (or both) in plan only. Often called Line Map.

**Planimetry**—The plan details of a map.

**Planish**—To polish metals by rubbing with a hard smooth tool.

**Plank or Timber Dam**—A dam built wholly of plank or boards.

**Planning**—The capacity to think in terms of experience larger than that which comes to any individual, to define distant goals, to arrange highly efficient ways and means of attaining them, and to pursue these distant ends consistently, yet with a flexibility which permits adjustment to changing conditions.

—A precise, coordinated economical management of operations, which condition can be met by the creation of an institutional mind. This

mind has a power of perception (investigation, research), of memory (records), of reasoning (analysis), and of design (planning). Such an institutional mind is a composite of, and yet is distinct from, the minds of the individuals of which it is composed; has a continuing life coincident with the life of the enterprise; and can think and arrange affairs with that large perspective made possible only by such characteristics. (Mississippi Valley Committee of the Public Works Administration.)

**Plant**—A word used in roadside development to denote a young tree, shrub, or herb; a slip, cutting, or sapling.

—In engineering economics, the physical property used in production, including machines, land, etc.

—**Consumption**—The water used by plants in the processes of growth. It includes that stored in the body of the plant and that dissipated from its leaf and body surfaces by transpiration.

—**Mix**—A term describing the mixing of mineral aggregate and bituminous products in a mechanical mixer, after which the finished mix is transported and laid on the road. Proportioning of aggregate constituents and bitumen is closely controlled and the mineral aggregate is usually dried and heated before mixing. Plant mixes may be of the fine, graded or coarse aggregate types and may be prepared to be either cold laid or hot laid.

—**Mixed Bituminous Surfacing**—The plant-mixed surfacings, as differentiated from road-mix types, are those in which the mineral aggregate and bituminous material are thoroughly mixed at a suitable plant and the mixture is then deposited on the road and spread to the proper cross-section.

**Planting Distances**—The measured

space between plants in any given bed or planted area.

**Plastering Sand**—The fine granular material naturally or artificially produced by the disintegration of rock, containing not less than 80 per cent by weight of silica, feldspar, dolomite, magnesite or calcite.

**Plaster of Paris**—A plaster made from gypsum by grinding and calcining it; so called from its manufacture near Paris.

**Plasticity**—As applied to gypsum, refers to a complex property of a material, involving a combination of the properties of mobility and of yield value. Note—A plastic material is distinct from a solid material in that it possesses mobility. It is distinct from a fluid material in that it requires a measurable force (yield value) to start flow.

—(of p. c. concrete)—A consistency of freshly mixed concrete which can be readily molded, but which changes form slowly when the mold is removed. A plastic consistency is between the dry, crumbly consistencies on the one hand, and the very fluid or watery consistencies on the other.

—**Index**—In soil technology, the difference between the liquid limit and the plastic limit.

**Plastic Limit**—In soil technology, the lowest moisture content, expressed as a percentage of the weight of the oven-dried soil, at which the soil can be rolled into threads one-eighth inch in diameter without the threads breaking in pieces.

**Plat**—A diagram drawn to scale showing land boundaries and subdivisions, together with all data essential to the description of the several units. A plat differs from a map in that it does not show additional cultural, drainage, and relief features.

**Plate**—A flat piece of metal.

—**Active** (in electricity)—(See active plate.)

- Plate, Anchor**—A square or rectangular plate, or washer, at the bottom of an anchor bolt.
- Bearing**—A plate which receives the load from a pin or a plate that rests on another plate.
- Bed**—A plate set in the top of the masonry to carry the load from the span.
- British**—(See British plate.)
- Cap**—The top plate on a steel column or post. It generally supports a load.
- Connecting**—A plate used to connect two or more members of a truss.
- Cover**—A plate fastened to the upper surface of a compression chord.
- A plate fastened to the top or bottom of the flanges of a girder.
- Dam**—(See dam plate.)
- Fish**—(See fish plate.)
- Gusset**—A large connecting plate used at panel points to join the chord and the web members.
- Hinged**—A plate containing a pin-hole for hinging the end of a member.
- Nadir Point**—(See Nadir.)
- Pin**—A plate riveted to a member where it bears on a pin to give more bearing on the pin.
- Roller**—A bed plate on which the rollers of the expansion end of a truss rest.
- Screen**—A screen composed of one or more perforated plates.
- Shoe**—The bottom plate of a shoe resting on the masonry.
- Sole**—(See sole plate.)
- Splice**—(See splice plate.)
- Tie**—A stay plate, binding two parallel parts of a steel member together.
- Web**—The plate forming the web of a girder.
- The plate between flanges of a built-up girder.
- Plateau**—An upland, tableland, or elevated plain having a fairly smooth surface and bounded on at least one side, by an escarpment separating it from lower country.
- Platform High**—A station platform at or near car floor elevation.
- Low**—A station platform at or near top of rail elevation.
- Observation**—A small deck fitted on the top of an airship for a lookout and defense or for making observations used in navigating the airship.
- Passenger**—A station platform on which passenger business only is handled.
- Station**—The prepared area adjacent to a station track for handling passengers and baggage, mail, and express, to and from trains.
- Trucking**—A station platform on which baggage, mail and express only are handled.
- Platinoid**—An alloy of nickel, copper, zinc, and tungsten used for electric resistors.
- Platy Structure**—(of rock) Refers to the structure developed in certain igneous rocks so that it breaks into plates parallel to the cooling surface.
- Play**—A looseness in a joint or in parts of a machine or structure permitting some freedom of motion.
- Playa**—A shore, strand, beach, or bank of a river.
- Playas**—Thin, flat sheet of fine clay and sand laid down in shallow basins of desert regions.
- Pleistocene**—The earlier of the two epochs comprised in the quaternary period. Also called the Glacial epoch and formerly called the Ice Age.
- Plicated**—Folded together, as in highly inclined and contorted strata.
- Plinth**—In architecture, the bottom member of a column base.\*
- Pliocene**—The latest of the epochs comprised in the Tertiary period, in the classification generally used. Also the strata deposited during that epoch.

**Plowing**—Taxying a seaplane at low speed before rising on the step.

**Plucking**—The process by which a glacier pulls away or quarries blocks of rock of considerable size from the sides of its channel; most effective where the ice passes over small cliffs or projections of strongly jointed rock.

**Plug**—In geology, an intrusive igneous mass, often rounded in cross-section, and taking the form of a more or less vertical pipe. Frequently found in the necks of old volcanoes.

—**and Feathers**—A quarryman's term. The plug is a wedge, and the feathers are two short pieces of half-round iron whose curved sides fit the drill hole while their flat sides receive the plug. By driving the plugs in a series of holes, a stone may be broken.

—**Tie**—Wooden plugs used for filling old spike holes in railroad ties, usually treated with a preservative.

**Plumb**—Vertical.

**Plumb Point**—(aerial photography) See Nadir.

**Plumbago**—The mineral graphite chiefly used in the manufacture of pencils, etc.

**Plumose Mica**—A variety of muscovite mica.

**Plums**—Stones or boulders of a volume of more than one cubic foot, incorporated in concrete masonry.

**Plunge Point**—(See diagram near definition of beach.)

—**Pool**—(hydraulics) A pool, basin, or hole scoured out by falling water at the base of a waterfall, as at Niagara Falls; a miniature development of the same general form which frequently characterized the cutting head of a gully forming in fine-textured homogeneous materials which are capable of standing in a vertical wall.

**Plus Distance**—Fractional part of 100 ft. used in designating the location of a point on a survey line;

as, "4 + 47.2," meaning 47.2 ft. beyond Station No. 4, or 447.2 ft. from the initial point, measured along a specified line.

—**Sight**—(See Backsight.)

**Plutonic**—In geology, rocks having consolidated at great depths; plutonic rocks are always holocrystalline and typically non-porphyritic.

**Pluvial**—In geology, due to the action of rain.

**Pneumatic**—Involving air under pressure.

—**Caisson**—(See caisson.)

—**Ejector**—A means of raising sewage, or other liquid, by alternately admitting it through a check valve into the bottom of a pot and then ejecting it through another check valve into the discharge pipe, by admitting compressed air to the pot above the liquid.

**Pneumatically Applied Mortar**—In tunnel construction, a mixture of Portland cement and sand, mixed dry. It is forced through a flexible tube to a nozzle where the mixture is hydrated and discharged by pneumatic pressure against the surface or lining being treated.

**Pneumatolysis**—In petrology, the process whereby minerals are produced wholly or in part from volatile compounds of one or other of their constituents, the agents concerned being the magmatic gases known as mineralisers.

—The alteration of rocks and the formation of minerals during or as a result of the emanation of gases and vapors from solidifying igneous rocks.

**Pocket**—A recess. A hole in rolled metal, as a cinder pocket.

—A hole or depression in the wearing course of a road.

**Podium**—In architecture, a continued pedestal die.\*

**Point, Dew**—(See dew point.)

—**Gate**—(hydraulics) A sharp pointed rod attached to a graduated staff or vernier scale for measuring the elevation of the surface

of flowing water. The point is lowered until the tip barely touches the water, forming a streak.

**Point of Compound Curvature (P.C. C.)**—The point of tangency common to two curves of different radii, the curves lying on the same side of the common tangent.

—**of Curvature (P.C.)**—The point where the alinement changes from a straight line or tangent to a circular curve; that is, the point where the curve leaves the first tangent.

—**of Intersection (P.I.)**—The point where the two tangents to a circular curve intersect. Also called Vertex.)

—**of Tangency (P.T.)**—The point where the alinement changes from a circular curve to a straight line or tangent; that is, the point where the curve joins the second tangent.

**Pointed, Smooth** — (See smooth pointed.)

**Pointing**—Filling joints or defects in the face of a masonry structure.

**Points, Cardinal** — (See cardinal points.)

—**Nodal**—(See nodal points.)

**Poisson's Ratio**—The ratio of the lateral deformation to the longitudinal deformation under longitudinal external forces within the crushing strength limit.

**Polar**—Relating to a pole or axis.

—**Equation**—An equation connecting polar coordinates.

—**Moment of Inertia**—The moment of inertia about an axis perpendicular to the plane of rotation or to the plane of the area considered.

—**Surface, Active**—(See active polar surface.)

**Polariscope** — An instrument for studying the properties of and examining substances in polarized light.

**Polarity Indicator**—In electricity, an instrument to indicate the direction of current flow in a D. C. circuit.

**Polarized Light**—In microscopy, light vibrating in one plane.

**Polarizer**—That one of the two Nicol prisms in a polarizing microscope through which the light passes before reaching the mineral section which is to be examined.

**Pole-distance** — The perpendicular distance in a force diagram, from the pole to the load line.

**Polished Section**—In cement technology, a polished surface of clinker, which after etching is used in the microscopic examination of the material.

**Polluted Water**—Water which has been fouled by sewage or other liquid and thus rendered offensive to sight or smell and unfit for culinary or industrial uses.

**Pollution**—The introduction into a water of substances of such character and in such quantity that they tend to render the body of water or river objectionable in appearance, or to cause it to give off objectionable odors.

—The act of making unclean or impure or the state of being unclean or impure as a result of admixtures of sewage, trade wastes, or other substance.

**Polygon**—An enclosed figure having many sides and angles.

—**Of Forces, Triangle or**—(See triangle or polygon of forces.)

**Polygonal Top Chord**—A top chord composed of panel length segments which form a polygon.

**Polyphase Transformer**—In electricity, a combination of single phase transformers arranged in a single tank.

**Ponding**—In highway work, when the compacting of an embankment during construction is not feasible, it is sometimes advantageous to resort to either ponding or jetting in order to hasten the settlement of the embankment. Ponding consists on flooding the embankment with water which is held tempo-

- rarily on the surface by longitudinal and lateral dykes.
- Pontoon**—Obsolete as applied to aircraft. (See float.)
- Pony Truss**—(See truss, pony.)
- (in irrigation)—A measure of the "openness" of soils permitting percolation.
- Popping** (of concrete)—A type of spalling which occurs on a concrete surface from some expansive force originating with the mass, but near the surface. Usually caused by expansion of a piece of aggregate either from moisture or temperature change. May also be caused by swelling of a lump of clay or a piece of wood.
- Porosity**—(of rock) The percentage volume of the total pore space in a given volume of rock.
- In soil technology, the volume of the voids or pores in a soil mass in percentage of the volume of the soil mass (volume of soil particles plus volume of the voids).
- Porphyritic**—(rock) A term applied to rock texture to designate the presence of isolated crystals in a general mass (matrix or ground-mass) or finer material.
- Porpoising**—An undulatory movement of a seaplane consisting of a combination of a vertical oscillation and an oscillation about its transverse axis, which occurs at certain stages of planing.
- Portable Compressor**—A complete air compressor plant consisting of compressor, prime mover and air received all mounted on a chassis so that it may be readily moved.
- Portal**—The opening between end posts or the end batter posts of a through truss bridge.
- Portland Cement**—Is the product obtained by finely pulverizing clinker produced by calcining to incipient fusion an intimate and properly proportioned mixture of argillaceous and calcareous materials, with no additions subsequent to calcination excepting water and calcined or uncalcined gypsum.
- Position Light**—Any one of a group of lights—red, green, and clear—used aboard an aircraft to indicate its position and direction of motion.
- Positive Reaction**—A reaction caused by and opposed to a direct load.
- Reinforcement**—Reinforcement so placed as to take tensile stress due to positive bending moment.
- Rotation**—Rotation in the same direction as that of the hands of a clock.
- Shear**—A relative term usually applied to a shear producing an upward motion.
- Positive-Driven-Type Supercharger**—A supercharger driven at a fixed speed ratio from the engine shaft by gears or other positive means.
- Post**—A piece of wood, metal or other material, set upright and used to support other members of a structure. A vertical, or nearly vertical, compression member.
- Glacial**—Subsequent to a period of glaciation; subsequent to the Pleistocene, or glacial period.
- Handrail**—A post supporting the handrail and its attachments. The vertical member of a handrail.
- Poststone**—A fine-grained sandstone.
- Pot, Dash**—(See dash pot.)
- Potential Energy**—Energy due to position of one body with respect to another or to relative parts of the same body.
- (hydraulics)—Energy due to position. The potential energy of a given flow with reference to any datum is represented by the product of the elevation of its water surface above that datum, and its weight.
- Indicator**—In electricity, an instrument for measuring and indicating potential difference in terms of voltage.
- Pot-Hole**—A hole extending below

the wearing course of a road surface.

**Potholes**—(geology) In eddies and at the foot of cascades where the water has a swirling motion, the stones lying on the bottom are whirled around and excavate cylindrical holes known as "potholes."

**Pottscot**—A trade name for slag granulated by a special process.

**Pound-foot**—A unit of moment, equal to that produced by a force of one pound acting with a lever arm of one foot.

**Powder, Ammonia Nitrate**—(See ammonia nitrate powder.)

—**Argus**—(See argus powder.)

—**Blasting, Oxalate**—(See oxalate blasting powder.)

—**Brass**—(See brass powder.)

—**Earthquake**—(See earthquake powder.)

—**Fuse**—A gunpowder of special quality and constant composition, consisting of mealed powder; that is, of very fine granulation, but free from dust.

—**Judson**—(See Judson powder.)

—**Vulcan**—(See Vulcan powder.)

**Powdered Asphalt**—Hard asphalt crushed or ground to a fine state of subdivision.

**Power**—The time rate at which work is done.

—**Head**—A machine placed over a well connected to the power unit and which, by means of the pump rods, operates the piston in the working barrel.

—**Loading**—The gross weight of an airplane divided by the rated horsepower of the engine computed for air of standard density, unless otherwise stated.

—**Monochromatic Emissive**—(See monochromatic emissive power.)

—**Pump**—A reciprocating pump driven by power from an outside source applied to the crankshaft of the pump.

—**Tools**—Those operated by a specific type of energy as gasoline

engine, electricity, or compressed air, including such machines as drills, grinders, hack saw machines, etc.

**Pratt Truss**—(See truss, Pratt.)

**Precast Concrete**—Concrete which is cast into forms and then hoisted and set in place.

**Precipitation**—The process by which water in liquid or solid state is discharged out of the atmosphere, upon a land or water surface.

**Precise Level**—A modification of the Y-level with improvements and additions permitting of more accurate work.

**Precision**—Degree of fineness of reading in a measurement, or, the number of places to which a computation is carried. The precision of a measurement is indicated by the number of figures that apparently have been determined; in a computation the precision is shown by the number of places used. A high precision indicates that errors of observation are small, but it does not show that constant (or systematic) errors have been eliminated. The number, 2.42, shows a higher precision than 2.4, but it is not necessarily any more accurate. An accurate result is one which is believed to have been freed from as much error as possible. See, also, Accuracy.

**Preferred Stock**—Preferred stock is that which has the first call on the income of a company for dividends, after payment of expenses, taxes and bond interest.

**Preformed Wire Rope**—A wire rope, the strands of which have been permanently shaped to the helical form they assume in the finished rope before the strands have been fabricated into the rope.

**Prehnite**—A greenish complex silicate containing silica, alumina, lime, and water.

**Preliminary Tank (sewage)**—Settling tank used for partial treatment of sewage; is undertaken usually be-

- fore further treatment is given.
- Premix**—Materials mixed at a plant, or mixed before delivery to place where used.
- Pre-Molded Concrete Piles**—Piles which are molded previous to driving.
- Present Value**—In engineering economics, a term referring to depreciated value.
- Preservative**—In road stabilizing work, any treatment or material applied to the upper portion or to the top of the natural-soil foundation, the soil-substructure, the sub-base, or the base, which renders it temporarily serviceable as a riding surface. Example: A chemical or oil treatment, or a thin bituminous mat applied to clay, sand-clay, caliche, bound gravel, macadam, etc., to prevent or retard raveling and dust while the road structure is weathering under traffic on a "stage construction" project.
- (timber)—The oil, bitumen, salts, or other treating material injected into timber to prolong its life.
- Press, Drill**—(See drill press.)
- Filter**—(See filter press.)
- Pressure**—Total load or force acting upon a surface; frequently used to indicate intensity of pressure or pressure per unit area.
- Altitude**—(1) The altitude corresponding to a given pressure in a standard atmosphere. (2) The altitude at which the gas bags of an airship become full.
- Dynamic**—(See dynamic pressure.)
- Flap**—A flap valve fitted in the outer cover or envelope of a rigid airship and arranged to permit the rapid flow of air in and out—particularly inward. The purpose is to facilitate the rapid equalization of the pressure of the air in the envelope with that of the surrounding air.
- Head**—(hydraulics) The head on any point in a conduit represented by the height of the hydraulic grade line above that point.
- Height**—(See height, pressure.)
- Impact**—(See impact pressure.)
- Jetting**—The process of forcing water through a pipe with opening at the bottom of a pile, to assist in driving the pile.
- Manometer** (aerostat)—The excess pressure inside the envelope of an aerostat over the atmospheric pressure at a standard reference point. The point of reference for the excess pressure is usually the bottom of the envelope or gas cell on airships and the level of the basket on kite balloons.
- Maximum Sound**—(See maximum sound pressure.)
- Normal**—(See normal, pressure or atmosphere.)
- Peak Sound**—(See peak sound pressure.)
- Period**—In wood preservation, that portion of a treating operation during which the preservative is under pressure.
- Plate**—(photography) A glass plate placed in the image plane of a film camera to cause the film to lie flat during exposure.
- Pump**—A machine designed for applying force with liquids.
- Treatment**—In wood preservation, the process in which pressure is applied to force preservatives into wood.
- Pressure-Rigid Airship**—An airship combining the principles used in both rigid and nonrigid airships to maintain shape and skin tautness.
- Price**—The quantity of money paid or demanded for a property where a sale is contemplated. Market price as distinguished from actual cost to produce.
- Analysis**—An appraisal term defined as the systematic recording, breaking down and arranging in a form for comparative studies of data on actual construction costs, prices of materials, wages, produc-

tivity of labor, quotations on equipment, freight rates, trade discounts, and other matters pertaining to the developing and maintaining of statistical information for the use of appraisers.

—**Unit**—In appraising, the amount used to represent the original historical or reproduction cost of one or one of a number of similar items or units of property which, when multiplied by the total number, will determine the cost of the whole.

**Pricing**—In appraising, the process of applying unit prices to the property inventory. Appraisal organizations usually have pricing departments with pricing records and specialists for the maintenance and use of the records.

—**Phase**—The first phase to crystallize from the melt of any given composition.

**Primary Coil**—In electricity, the large wire coil or conductor of an induction coil or transformer through which alternate inducing currents are sent.

—**Focal Plane**—(See Focus.)

—**Focal Point**—(See Focus.)

—**Minerals**—Those minerals that retain their original form and composition, as original sulphides.

—**Structure** (stress analysis)—The main framework, including fittings and attachments. Any structural member, the failure of which would seriously impair the safety of the airplane, is a part of the primary structure.

—**Tank**—Settling tank used for partial treatment of sewage.

—**Truss**—A main truss which supports smaller trusses.

**Primary-Type Glider**—A ruggedly built glider designed for use in elementary training of student glider pilots.

**Prime Coat**—The first or penetrating application of a bituminous material, usually on an untreated sur-

face. Sometimes applied to a weathered or worn surface course before addition of a surface treatment.

**Priming**—The sudden evolution of steam from a heating surface which throws water in large volumes up into the steam space.

—The first coat of thin paint applied to new or weathered wood or to other porous surfaces prior to painting.

—The first filling of a canal, reservoir or other structure; i. e., either the absolute first, or the seasonal first.

—Starting the flow, as in a pump or siphon.

—The process of applying a prime coat.

**Principal Design Section**—The vertical sections in a flat slab on which the moments in the rectangular directions are critical.

—**Distance**—(photography) The distance measured along the lens axis, between the rear nodal point of the lens and the principal point of the photograph.

—**Line**—(vertical aerial photography) Imaginary line on the photograph joining the principal point and the plate nadir. In a tilted photograph, this condition defines one and only one principal line, but in a truly vertical photograph there are an infinite number of lines that satisfy this condition.

—**Lunar Component**—The lunar component ( $M_2$ ) which gives two high and two low waters in a tidal day of 24 hours and 50 minutes.

—**Meridian**—(public land surveys) The meridian established through the initial point of a system of coordinated township boundary lines. See, also, Base Line.

—**Plane**—(vertical aerial photography) The vertical plane through the exposure station containing the optical axis of the camera. In a tilted photograph, this condition defines one and only one principal

plane (i. e., the plane perpendicular to the axis of tilt) but in a truly vertical photograph there are an infinite number of planes that satisfy this condition.

—**Planes**—(optics) The two conjugate planes perpendicular to the optical axis for which the lateral magnification produced by an optical system is unity and positive. In the ordinary telescope or camera, they coincide with the nodal planes.

—**Point**—(optics) Point of intersection of the optical axis with either of the two principal planes. (Also called Gauss Point.) In the ordinary telescope or camera, the two principal points coincide with the nodal points.

—(photographic mapping) The point where the lens axis intersects the plane of the photographic plate, or more exactly, the foot of the perpendicular from the emergent node of the camera lens to the plane of the photographic plate. (Also called Optical Center.)

—**Solar Component**—The solar component ( $S_2$ ) which gives two high and two low waters in a solar day of 24 hours.

**Principle, Archimedes**—(See Archimedes principle.)

**Prior Lien Bond**—A bond entitled to a claim on the property prior to that of some other issue or issues is referred to as a prior lien bond.

**Prism**—In hydraulics, the liquid mobile volume of a stream.

—In grading, the volume of a length of embankment or excavation.

—In general, any solid bounded by planes.

**Prismoid**—Any solid bounded by planes, and whose end-faces are parallel. It is usually understood to include also figures whose bounding surfaces are warped surfaces.

**Private Road or Driveway**—Every way or place in private ownership

and used for vehicular travel by the owner and those having express or implied permission from the owner, but not by other persons.

**Process, Barff's**—(See Barff's process.)

—**Chenot**—(See Chenot process.)

—**Clark**—(See Clark process.)

—**Cyanide**—(See cyanide process.)

—**Dry-Press**—(See dry-press process.)

—**Electric Furnace**—(See electric furnace process.)

**Producer, Dawson**—(See Dawson producer.)

—**Flush**—(See flush production.)

**Production, Cost of**—(See cost of production.)

**Profile**—The intersection of a vertical plane through the center line with the surface of the ground and the plane of the roadbed, or a drawing representing the same.

—A vertical section of the surface of the ground, or of underlying strata, or both, along any fixed line. On a railway or highway, the profile is usually taken along the center line, the elevations of the regular station points, and of any intermediate points where changes of slope occur, being determined by spirit-leveling. In order to exaggerate the slopes, the scale used for the elevations is usually larger than that used for horizontal distances.

—**Drag**—(aeronautic) The difference between the total wing drag and the induced drag.

—**Drag, Effective**—(aeronautic) The difference between the total wing drag and the induced drag of a wing with the same geometric aspect ratio but elliptically loaded.

—**Grade**—The trace of a vertical plane intersecting the pavement or wearing surface or other structure, usually along the longitudinal center line of the pavement or structure.

- Leveling**—Leveling in which the object is to get the elevations at known distances apart and thus obtain the profile of a surface along a given line.
- Thickness**—(aeronautic) The maximum distance between the upper and lower contours of an airfoil, measured perpendicularly to the mean line of the profile.
- Profilometer**—A machine for recording the irregularities of the surface of the pavement.
- Progressive Tidal Wave**—A wave the crest of which advances, so that the times of high and low water progress from one end of a body of water to the other.
- Project**—A scheme or plan for creating or changing physical property.
- Projected Propeller-Blade Area**—(aeronautic) (See area, projected propeller-blade.)
- Projection**—(mapping) A geometric (or mathematical) system of constructing the true meridians and parallels, or the plane rectangular coordinates on a map.
- (photography) The process of placing a negative or positive photograph in a projecting camera and reproducing the image on a screen or on a sensitized photographic medium.
- Isometric**—A mode of geometrical drawing in which three planes are projected at equal angles upon a single plane, and all the measurements are upon the same scale; used at times to show machinery, buildings, etc.
- Projector**—A device for projecting a beam of light, as a searchlight projector.
- Bearing**—(See bearing projector.)
- Ceiling**—(See ceiling projector.)
- Traffic-Control**—(aeronautic) (See traffic-control projector.)
- Proof Stress**—The maximum unit stress that may be applied for a specified short time, which will not produce a permanent deformation of more than a specified amount.
- Propeller**—Any device for propelling a craft through a fluid, such as water or air; especially a device having blades which, when mounted on a power-driven shaft, produce a thrust by their action on the fluid.
- Area**—(See area, propeller.)
- Efficiency**—The ratio of the thrust to the input power of a propeller.
- Pump**—A pump of this type, sometimes called an axial flow pump, develops most of its head by the propelling or lifting action of the vanes on the liquid. It has a single inlet impeller with the flow entering axially and discharging nearly axially into a guide case. Pumps of this type usually have a specific speed of above 9,000.
- Pump, Centrifugal Screw or**—(See centrifugal screw or propeller pump.)
- Radius**—(See tip radius.)
- Rake**—(aeronautic) The mean angle which the line joining the centroids of the sections of a propeller blade makes with a plane perpendicular to the axis.
- Root**—(aeronautic) That part of the propeller blade near the hub.
- Thrust**—(aeronautic) The component of the total air force on the propeller which is parallel to the direction of advance.
- Thrust, Effective**—The net driving force developed by a propeller when mounted on an aircraft; i. e., the actual thrust exerted by the propeller, as mounted on an airplane, minus any increase in the resistance of the airplane due to the action of the propeller.
- Thrust, Static**—(aeronautic) The thrust developed by a propeller when rotating without translation.
- Tipping**—(aeronautic) A protective

covering of the blade of a propeller near the tip.

**Propeller-Blade Area**—(See area, propeller-blade.)

**Propeller-Disk Area**—(aeronautic) (See area, propeller-disk.)

**Property**—The rights of ownership and future benefits from tangible or intangible assets.

—**Colligative**—(See colligative property.)

—**Facts**—In appraising, data obtained from the actual assets, usually by personal inspection and observation.

—**Fixed**—(See fixed property.)

**Proportional Limit**—Unit stress at which the deformation ceases to be directly proportional to the load as determined by strainometer (extensometer for tension, compressometer for compression, and deflectometer for transverse tests, value being read from plotted results).

**Proportions, Multiple, Law of**—(See law of multiple proportions.)

**Propulsive Efficiency**—The ratio of the product of the effective thrust and flight speed to the actual power input into the propeller as mounted on the airplane.

**Prostyle**—In architecture, a portico projecting from a building and supported by columns in front.\*

**Proscenium**—In architecture, the front part of a stage including the arch.\*

**Protected Terrace Outlet**—In soil erosion, the terrace outlet protected against cutting by structures or vegetation.

**Protractor**—An instrument for laying down and measuring angles on paper, used in drawing and plotting.

**Proximate Analysis**—In the case of coal and coke, the determination, by prescribed methods, of moisture, volatile matter, fixed carbon (by difference), and ash.

**Pruning**—Refers to properly cutting

away certain parts of a plant in a neat and orderly manner, as contrasted to "butchery."

**Pseudomorph**—A crystal, or apparent crystal, having the outward form proper to another species of mineral, which it has replaced by substitution or by chemical alteration.

**Psychrometer**—An instrument for determining relative humidity.

**Pudding Stone**—A conglomerate in which the pebbles are rounded.

**Puddle**—To convert cast iron into wrought iron by melting and stirring in a reverberatory furnace.

—(noun) Material placed with water to form a compact mass to reduce percolation; (verb) To place such material.

—**Ball**—A lump of red-hot, plastic iron taken from the puddling furnace for hammering or rolling.

—**Cinder**—Cinder removed from the molten metal after the processes of oxidizing the impurities has been completed.

**Puddler's Candle**—One of the jets of flame which spring from molten iron while the carbon is being removed in a puddling furnace.

**Puddling Furnace**—(See furnace, puddling.)

**Pugmill**—A fixed vessel with rotating blades designed to give a specified bituminous coating on the aggregate used. (See mill, pug.)

**Pulaski Tool**—A combination ax and hazel hoe.

**Pulley**—A term sometimes applied to a sheave.

**Pull-Out**—(aeronautic) The maneuver of transition from a dive to horizontal flight.

**Pull-Up**—A maneuver, in the vertical plane, in which the airplane is forced into a short climb, usually from approximately level flight (cf. zoom).

**Pulsometer**—A device for pumping water by steam applied direct to the water. It consists of two pear-

shaped vessels in one casting, the necks of which terminate in a single chamber having two valve seats with one ball valve which oscillates between them. It also has an air chamber and suction and discharge valves.

**Pulverized Lime**—Quicklime which will pass a fine sieve of specified size. Note—The size of the sieve is usually  $\frac{1}{4}$ -inch.

—**Limestone**—The product obtained by grinding either calcareous or dolomitic limestone so that all of the material will pass a 20 mesh sieve and at least seventy-five per cent shall pass a 100 mesh sieve.

**Pulvinated**—In architecture, a term applied to a frieze having a convex section.\*



*Photo courtesy L. R. Moretti*

*California pumice, 30 lb. block*

**Pumice, Pumice Stone, Pumicite**—Those rocks composed of highly vesicular volcanic glass, resulting from the hardening of the glass froth occurring around the vent of an active volcano. The color is

white, gray, yellowish or brown and sometimes red. On examination with a lens, the material is seen to be composed of a mass of silky glass fibers of a cottony appearance, extremely porous like a sponge.

**Pump, Centrifugal**—A circular casing within which revolves an impeller mounted on a shaft. The water enters the impeller at the center and passes outward between the vanes into the surrounding casing and to the discharge pipe.

—**Centrifugal Screw or Propeller**—(See centrifugal screw or propeller pump.)

—**Centrifugal Volute**—(See centrifugal volute pump.)

—**Compound**—A direct connected steam pump in which the steam is allowed to expand in two or more cylinders.

—**Double Acting**—A pump in which the plunger or piston acts upon the fluid column on both the forward and return stroke.

—**Double Stroke Deep Well**—A pump that employs two separate balanced lines of pump rods and attached water pistons.

—**Duplex Double Acting**—A pump having two pistons operating inside of cylinders which fill at one end and discharge at the other at each stroke.

—**Efficiency, Field**—Obtained by correcting the laboratory pump performance for the particular pump by the discharge column friction and the shaft loss adopted as standard by Hydraulic Institute.

—**Efficiency, Laboratory**—Due to inherent differences between a deep well turbine pump and all other types of pumps, the laboratory pump efficiency is defined as the ratio of the energy converted into useful work, to the energy applied to the pump shaft in the laboratory—that is, the ratio of the water horsepower output to the

laboratory shaft horsepower input, when the pump is installed in the laboratory with its head, short section of discharge column, suction pipe and suction strainer.

**Pump Governor**—A device for regulating the pressure of water delivered by a pump by controlling the power delivered to the pump.

—**Multi-Stage Centrifugal**—(See multi-stage centrifugal pump.)

—**Parts**—Types of principal component parts of deep well turbine pumps are:

Types of Heads—(a) Unit head with separate or built-in motor. (b) Flexible coupling. (c) Belted head. (d) Geared head. (e) Combination head.

Types of Discharge Column—(a) Enclosed lineshaft, oil lubricated. (b) Enclosed lineshaft, water lubricated. (c) Open lineshaft, water lubricated.

Types of Impellers for Bowl Assemblies—(a) Enclosed impeller. (b) Semi-enclosed impeller. (c) Open impeller.

Unit Head includes vertical, hollow, or solid shaft motor direct connected to the lineshaft, the thrust load being carried on the motor bearing.

Flexible Coupling Head includes a thrust bearing to carry the thrust load, both halves of a flexible coupling, and a frame or stand for mounting a vertical motor or other suitable prime mover.

Belted Head includes a thrust bearing to carry the thrust load and a pulley for either flat or V-belt.

Geared Head includes a gear housing and gears with a thrust bearing to carry the thrust load and a horizontal drive shaft.

—**Piston**—A pump in which a finished cylinder is closely fitted with a reciprocating piston and forces a volume of water varying with the area of piston and the stroke.

—**Plunger**—A pump in which the reciprocating part is a plunger which enters the cylinder through packing glands and displaces a volume of water equal to the volume of the plunger entering the cylinder.

—**Reciprocating**—A pump in which the piston or plunger alternately draws the water in and discharges it from the cylinder.

—**Rods**—The line of rods which connect the piston in the working barrel with the power head.

—**Rotary**—A pump, the working part of which is a revolving shaft to which are secured discs or cams, which are in close contact with the walls of the enclosing chamber or shell at two or more points.

—**Single Stage Centrifugal**—(See single stage centrifugal pump.)

—**Stage**—A term used in connection with centrifugal pumps to indicate the number of impellers, a single stage pump having one impeller, a two stage pump two impellers, etc. (See single stage, two stage, triplex, multi-stage.)

—**Turbine**—(See turbine pump.)

—**Vertical** (suction type)—See vertical pump (suction type.)

—**Vertical** (submerged type)—See vertical pump (submerged type.)

**Pumping Head, Field**—The laboratory pumping head of a deep well turbine pump as defined, reduced by discharge column friction head for the depth of setting and size of column for the particular installation.

—**Head, Laboratory**—The measured distance from water level in the test sump or well to the center line of the discharge pressure gauge located just beyond the discharge elbow, plus the pressure gauge reading.

**Punch**—A machine for forcing or shearing holes in metal. To make a hole with a punch.

—**Center**—A marking punch that makes a small indentation in steel

- so as to locate the center for a rivet-hole.
- Gang**—A machine that punches two or more holes at one operation.
- Pilot**—(See pilot punch.)
- Purchase**—A leverage hold on a load or weight.
- Pure Resistance**—In electricity, the ohmic resistance.
- Stress**—A term used for cases where only one kind of stress exists.
- Tone**—(simple tone) In acoustics, a sound produced by an instantaneous sound pressure which is a simple sinusoidal function of the time.
- Purity** (of gas)—(aeronautic) The ratio of the partial pressure of the aerostatic gas in the container to the total pressure of all the contained gases.
- Purlin**—A member laid horizontally upon the principal rafters of a roof to support the covering.
- Push-Down**—(aeronautic) The opposite of pull-up.
- Pusher Airplane**—An airplane with the propeller or propellers aft of the main supporting surfaces.
- Propeller**—A propeller mounted on the rear end of the engine or propeller shaft.
- Putrefaction**—Biological decomposition of organic matter with the production of ill-smelling products. It occurs under conditions of oxygen deficiency.
- Putrescibility**—The capability of sewage, effluent, or wet sludge to putrefy under the conditions to which it is subjected.
- Puzzolan**—A general term for a siliceous material which in itself has no cementing value, but which exhibits cementing properties when mixed with hydrated lime.
- Cements**—Cements made by incorporating slaked lime with finely ground slag or volcanic ash or by incorporating a small portion of Portland cement clinker with suitably treated slag and grinding intimately the mixture.
- Lime Cement**—A cement made by blending a puzzolan with lime.
- Portland Cement**—A cement made by blending a siliceous material (puzzolan) with a Portland cement, either by inter-grinding or by adding the siliceous material to the cement. The active silica of the puzzolan combines with the lime set free during the hydration of the Portland cement, forming compounds which have cementing properties.
- Pycnometer**—A calibrated bottle used for measuring the volume and weight of a liquid in determining its specific gravity; a small calibrated bottle for determining the specific gravity of grains or small fragments.
- Pycnostyle**—In architecture, a treatment employing  $1\frac{1}{2}$  diameters or less between columns.\*
- Pylon**—Generally refers to a prominent architectural treatment such as a column or a shaft or a projecting portion of a wall which gives the effect of a shaft.
- Pyrite**—A hard, heavy, shiny, yellow mineral,  $\text{FeS}_2$ , generally in cubic crystals. Fool's gold.
- Pyroclastic**—Fragmental rocks such as tuffs and breccias, produced by an explosive or igneous action.
- Pyrometer**—Any instrument for measuring degrees of heat, especially above those indicated by the mercurial thermometers.
- Pyrometric Cone Equivalent**—An index of the heat-resisting qualities or refractoriness of ceramic materials. Designated as P.C.E.
- Pyrrhotite**—A sulphide of iron, having the approximate formula,  $\text{Fe}_{11}\text{S}_{12}$ , and containing about 38 per cent sulphur, and about 62 per cent iron.



- Quadrant**—The quarter of a circle; an arc of 90 deg.
- Quantities**—The amount of material to be handled, expressed in the prescribed units.
- Quaquaversal**—Dipping outward in all directions from a central point; as a dome in stratified rocks.
- Quarry**—A deposit of rock out of which dimension stone or crushed or broken stone is being mined.
- Faced**—A rough face of stone, only the larger projections having been knocked off with a hammer.
- Water**—Water that fills the pore spaces of a rock as it lies in its original bed.
- Quartering**—Dividing a sample of material by thoroughly mixing it and striking it off into four parts. The one-fourth part is again mixed and quartered and so on until the volume is the amount required for testing.
- Quarter Point**—A point on the cross section of a roadway midway between the center and the edge. Sometimes called haunch.
- Quarternary**—The later of the two geologic periods comprised in the Cenozoic era.
- Compound**—A compound of four components.
- Quarters**—The four sections of equal width which, side by side, make up the total width of a roadway.
- Quartz**—Is composed entirely of silica ( $\text{SiO}_2$ ), is colorless when pure, but often tinted yellow, red, blue, violet. It has a specific gravity of 2.65, and is the most common mineral in sand.
- Monzonite**—Technical designation for a granite in which the percentages of soda-lime feldspar and of potash feldspar are nearly the same or in which the former exceeds the latter.
- Wedge**—In mineralogy, a wedge-shaped piece of quartz used in optical work.
- Quartzite**—A metamorphosed quartz sandstone, formed by the deposition of secondary silica between the original grains, so that the rock is more firmly cemented and less porous than before and tends to break across the grains.
- Quay**—A structure provided with facilities on one side for vessels to load and discharge cargo, passengers and supplies.
- Queen Post**—The vertical post in a "Queen Post Truss."
- Post Truss**—A type of trussed beam having two vertical posts.
- Quenching**—A very rapid cooling of a melt designed to procure the complete solidification of the liquid to a glass in order that a primary phase may be observed.
- Immersing to cool.**
- Quicklime**—A calcined material, the major part of which is calcium oxide or calcium oxide in natural association with a lesser amount of magnesium oxide, capable of slaking with water.
- Quicksand**—A mass of fine sand or of silt and argillaceous matter, thoroughly saturated with water, forming a semi-fluid, having all the properties of a fluid but in a minor degree.
- Quicksilver**—(See horn quicksilver.)
- Quirk**—An acute angle or recess. A deep indentation.
- Quoin**—(See hollow quoin.)
- Quoins**—In architecture, large cut stones at the corner of a masonry wall.\*

# R

**Race**—(hydraulics) The channel that leads water to or from a water-wheel; the former is "head race," the latter, "tail race."

**Rack**—A screen composed of parallel bars to catch floating debris.

**Rack-and-Pinion Jack**—A jack using a rack and pinion to attain its lifting motion.

**Racked Back**—Built in steps or offsets.

**Racking**—Shaking so that the connecting rivets are loosened and the structure thus permanently injured.

**Radial Engine**—(See engine, radial.)

—**Flow**—Direction of flow across a circular tank, from center to periphery, or vice versa.

—**Gate**—A pivoted gate the face of which is usually a circular arc with center of curvature at the pivot; a Tainter gate.

—**Line Plot**—(aerial photographic mapping) Plot constructed from vertical aerial photographs in which lines radiating from the principal points of the photographs are used as horizontal directions to plot the image points by graphic triangulation.

—**Wire**—A wire that extends from an axial fitting at the center of a transverse frame of a rigid airship to one of the vertices of the frame.

**Radian**—An arc of a circle equal to the radius, or the angle at the center measured by it.

**Radiation, Intensity of**—(See intensity of radiation.)

**Radio Loop**—(See loop, radio.)

—**Mast**—A mast attached to an aircraft which serves as part of the radio-antenna structure.

**Radio-Marker Beacon**—A radio transmitter of low power emitting a characteristic aural signal to in-

dicate course positions with respect to a landing field or an airway.

**Radio-Range Beacon**—A radio transmitter supplying directive radio waves that provide a means of keeping an aircraft on its proper course.

**Rafter**—One of the members in a roof to which the roofing is fastened.

**Rail, Docking**—A rail or guide, installed on the landing field and extending into the shed, which affords a means for resisting the lateral pull of an airship's docking or handling lines.

—**Saw**—A power machine, provided with a circular saw of either the toothed or friction type, used to cut steel rails. Small portable machines are in common use and larger units mounted on a railroad car are also employed.

—**Section**—The shape of the end of a rail cut at right angles to its length.

—**Skids**—Two metal rails securely fastened to the underside of railway motor car frame between the wheels to act as skids in placing car on or off the track.

—**Steel Bars**—The established trade and technical term designating bars hot-rolled from standard tee-section rails. Not to be confused with so-called "rerolled" steel or "rail steel equivalent."

—**Steel Equivalent**—A material rolled from high carbon steel which may have the approximate tensile properties of standard rail steel, but does not comply with specified requirements for manufacture.

**Railroad**—A carrier of persons or property upon cars, other than street cars, operated upon stationary rails.

- Train**—A steam engine, electric or other motor, with or without cars coupled thereto, operated upon rails, except street cars.
- Rainfall**—Precipitation in the form of water. Usage of the term includes snow and hail.
- Penetration**—The depth below the soil surface reached by a given quantity of infiltration from rainfall. Under arid and semi-arid climatic conditions, this depth frequently does not extend beyond the root zone.
- Rate**—Precipitation, generally expressed in inches per hour.
- Rake**—The inclination to the vertical which a member of a bridge takes.
- (architectural) Inclination from the horizontal, as the slope of a roof.
- Propeller**—(See propeller rake.)
- (aeronautic) The combination of tubes and springs mounted in gimbals at the top of a mooring mast to ease the shock when the moor is made.
- Hydraulic**—(See hydraulic ram.)
- Ramming**—(aeronautic) The effect obtained when the air intake to the engine is placed in the slipstream in such a manner as to take advantage of the difference in velocity of this air intake and the slipstream, in order to increase the pressure in the induction system.
- Ramp**—An inclined way connecting different levels.
- A concave sweep connecting a higher and a lower portion of a railing, wall, etc.
- Wall**—The wing of an abutment, often called a ramp.
- Random Line**—1. A trial line, directed as nearly as may be toward a fixed terminal point which is invisible from the initial point. 2. A random traverse.
- Stone**—A term applied by quarrymen to quarried blocks of any dimension.
- Traverse**—A traverse run from an initial to a terminal point to determine the direction of the latter from the former.
- Range**—The prolongation (usually by eye) of any line to intersect a transit line, or other fixed line. Example: The side of a building or the line of a fence may be ranged on to a transit line; or on to the line of the side of another building. The point of intersection is said to be "in range with" the fence, or with the sides of the two buildings.
- (hydrography) An established line along which soundings are taken.
- at Maximum Speed**—The maximum distance a given aircraft can fly at full speed at the altitude for maximum speed under given conditions.
- Line**—(public land survey) Any meridional township boundary line.
- Masonry**—Masonry in which the various courses are laid up with continuous horizontal beds.
- Maximum**—The maximum distance a given aircraft can cover under given conditions, by flying at the economical speed and altitude at all stages of the flight.
- Of Tide**—The difference in height between a high water and a preceding or following low water.
- Ranger**—A long horizontal timber along the side of a trench, against which the "braces" abut.
- Rankine Scale of Temperature**—The absolute Fahrenheit scale.
- Rapid Curing Cut-Back**—Asphalt cement fluxed with a gasoline or naphtha type of distillate.
- Rapids**—Swift, turbulent flow of water.
- A term used by some writers for "chute."
- Rate Base**—In appraising, the total amount used or claimed as the investment upon which a public utility is entitled to a fair return and on which rates may be based.

- Charging**—(See charging rate.)
- Rated Engine Speed**—The rotative speed of an engine at which its reliability has been determined for continuous performance.
- Horsepower of an Engine**—(See horsepower of an engine, rated.)
- Rate-of-Climb Indicator**—An instrument that indicates the rate of ascent or descent of an aircraft.
- Rating**—The relation empirically determined between stage and flow of water. The taking of measurements at a given station by current meter or otherwise to determine this relationship is termed "rating the station."
- Curve**—In hydraulics, a graphic representation of the relation between stage and flow.
- A calibration.
- Flume**—An open conduit built in a channel to maintain a consistent regimen for the purpose of measuring the flow and developing stage-discharge relation; a flume containing still water for rating current meters, Pitot tubes, etc.
- Ratio, Fuel**—(See fuel ratio.)
- Print**—(photography) A photograph the scale of which has been changed from that of the original negative by photographic enlargement or reduction to fit known distances between points.
- of Reinforcement**—The ratio of the effective area of the reinforcement cut by a section of a beam or slab to the effective area of the concrete at that section.
- Rattler**—Name given to the machine used in determining the abrasion loss of paving brick.
- Raveling or Unraveling**—A term applied to a type of concrete disintegration in which the concrete appears to be breaking up through disruption of the mortar or loss of bond, leaving at any stage coarse aggregate particles which are partially embedded.
- The loosening of the materials composing the crust.
- Ravine**—A deep, more or less linear depression or hollow worn by running water; a large deep gully.
- Raw Sewage**—(See crude sewage.)
- Rayon**—A generic term for filaments made from various solutions of modified cellulose by pressing or drawing the cellulose solution through an orifice, and solidifying it in the form of a filament, or filaments, by means of some precipitating medium.
- Rays**—The lines in a force diagram drawn from a selected pole to the ends of the several lines representing the forces in the load line.
- Razor Back**—A sharp narrow ridge.
- Reach**—(hydraulics) A comparatively short length of a stream or channel.
- Reaction**—In engineering, a passive force set up in opposition to an initial, active force; e. g., the upward pressure on the bottom of a beam resting on a support equal in amount to the downward pressure from the beam.
- Realgar**—An arsenic mineral having the formula  $\text{As}_2\text{S}_3$ . Contains about 30 per cent sulphur and 70 per cent arsenic.
- Ream**—To enlarge a hole by means of a cutting tool having fluted cutters on the side.
- Reamer**—A tool having fluted sides with cutting edges used for enlarging holes.
- Reaming**—Cutting with a reamer in order to enlarge rivet holes in steel.
- Iron**—A round, tapering tool with cutting edges for enlarging rivet holes.
- An iron tool used to open the seams between planks, so that they may be more readily calked.
- Réaumur**—Designating the Réaumur thermometer scale where 0 deg. is the freezing point of water and 80 deg. the boiling point.

**Recarburization**—The adding of carbon in some form to metal partially decarburized in some steel-making process in order to obtain the proper percentage of carbon in the finished product.

**Recent**—The later of the two geological epochs comprised in the Quaternary period.

**Reciprocal**—The reciprocal of a number is 1 divided by that number. The reciprocal of 20 is  $1/20$ , or 0.05, or 5 per cent.

**Reciprocating Compressors**—These are machines in which the compressing element moves back and forth within a confined space.

**Reciprocating-Type Supercharger**—A positive-displacement reciprocating pump in which the air or mixture is compressed by a piston working in a cylinder.

**Reconnaissance**—A preliminary examination or survey of a region in reference to its general geological characters, natural features, etc.

—A preliminary and usually rapid examination or survey of a region.

—**Map**—The plotted result of a reconnaissance survey.

**Recorder**—(hydraulics) A device that makes a graph of the stage, pressure, depth, velocity, or the movement or position of water-controlling devices.

—One who makes a record.

**Recording Gages**—Automatic instruments for making graphical records of an operation, time, process, pressure, flow, temperature or speed.

**Recovery, Water**—(aeronautic) (See water recovery.)

**Rectangular Weir**—A measuring weir with a rectangular notch. Unless a suppressed weir is specified, the term may be taken to mean a contracted weir.

**Rectification**—(aerial photography) The process of projecting the image on a photograph to any

other chosen plane of reference. This process is utilized in projecting the oblique photographs made with a multiple-lens camera into the plane of the vertical view, and in projecting tilted photographs from the inclined plane in which they were made, to the horizontal plane, with the aid of known positions and elevations of ground points.

**Rectilinear Tidal Current**—The current characteristic of inland bodies of water, with slack-water and reversing direction, running flood for a period of about 6 hours, and ebb in the opposite direction for a period of about 6 hours.

**Red Lead**—Minium,  $Pb_3O_4$ .

**Red-Dog**—Is the residue from burned coal dumps. The dumps are composed of waste products incidental to coal mining, which are not true coal but contain a certain percentage of carbon. Under pressure in the waste dumps, they frequently ignite from spontaneous combustion and the residue is a red-colored ash containing a high percentage of silica with certain mineral salts distributed throughout the mass, which when wetted will form a firm and hard surface.

**Red-Short Iron**—Iron containing sulphur, copper, or arsenic, which will cause it to crack when bent at a red heat, but permitting of considerable tenacity when cold.

**Reduction**—The production of metal from ore.

**Reduction of Area**—In steel, the percentage difference between the area of a bar before being subjected to stress and the area of the bar after rupture. The latter will be determined by measurements taken at the point of rupture.

**Reef**—A bar of earth or sand in the river channel under water.

**Reel**—A cylindrical wooden drum with flanges on which rope or wire is wound for shipping or storage.

**Reference Area**—(aeronautic) The area used in the equations defining the coefficient of the air force acting upon a body or the coefficients of the components of the air force. This area is logically or conveniently chosen in different manners for different types of bodies.

**Referencing**—The process of tying in points; that is, measuring horizontal distances and angles that will locate a point (such as an instrument station) definitely and accurately with reference to near-by permanent objects, for the purpose of finding or re-locating the station if it becomes disturbed or lost.

**Refined Asphalt**—Any asphalt which has been subjected to a refining process. In paving work this term, however, is usually restricted to asphalt which, after refining, is too hard for use in a given type of construction and must be softened to suitable consistency by combining it with flux oil.

—**Tar**—Tar freed from water by evaporation or distillation which is continued until the residue is of desired consistency; or a product produced by fluxing tar residuum with tar distillate.

**Reflection Goniometer**—In mineralogy, an instrument for measuring angles.

**Reflectivity, Acoustic**—(See acoustic reflectivity.)

**Refraction, Index of**—(See index of refraction.)

**Refractometer**—An instrument for determining the index of refraction of a mineral.

**Refractory Timber**—Timber which offers unusual resistance to the entrance of preservative; timber which is difficult to treat.

**Refuge-Bays**—Platforms built on the side of a trestle or bridge so that men and hand-cars can be gotten out of the way of approaching trains.

**Refunding Bond**—Usually secured by a general mortgage, subject to certain liens which they are issued to retire.

**Refusal Point**—In wood preservation, the point on the gage beyond which no more preservative can be forced into timber.

**Regenerative Furnace**—An open-hearth furnace using producer gas as a fuel, but so arranged that the gas is conducted to the hearth area through a passageway filled with red-hot bricks stacked to form an open checker-work. As the hot gas enters the furnace, it is mingled, in proper proportions, with air similarly heated; so that complete combustion is produced. The escaping gases are conducted through a second passageway filled with bricks which absorb much of the waste heat.

**Regional Metamorphism**—A name for extended metamorphism that, as contrasted with contact effects is manifested over large areas.

**Regimen**—(hydraulics) The condition of a stream and its channel as regards their stability. A river or canal is "in regimen" if its channel has reached a stable form as the result of its flow characteristics.

**Register**—In air conditioning, a grille with a built-in damper or shutter, for installation at air inlets and outlets.

—A mechanical device that either indicates or records, or both.

**Regolith**—A general term for the superficial blanket of denudation products which is widely distributed over the more mature "solid" rocks. The term includes weathering residues, alluvium, and aeolian and glacial deposits.

—The layer or mantle of loose, incoherent rock material, of whatever origin, that nearly everywhere forms the surface of the land and rests on the bed rock.

**Regula**—In architecture, a plain horizontal block beneath the taenia and triglyph of the Doric order.\*

**Regular Lay**—Right lay or standard lay is obtained by twisting the wires in the strand toward the left, and the strands in the rope toward the right.

**Regulator**—In sewage technology, a device for controlling the quantity of sewage admitted to an intercepting sewer or unit of a disposal plant.

—In water treatment, a device for controlling the flow of water or of chemicals into a tank of water.

—**Fuel Bypass**—(aeronautic) A device placed in the fuel line of a supercharged engine for regulating the fuel pressure in the carburetor float chamber so that it will be a fixed amount above the carburetor air pressure.

**Rehaul Line**—(See grass rope.)

**Reinforced Concrete**—Concrete in which metal is embedded in such a manner that the two materials act together in resisting forces.

—**Bond**—Adhesion between concrete and reinforcing steel.



*Photo courtesy Truscon Steel Co.*

*Welded steel reinforcement mesh in concrete road construction*

**Reinforcement**—In welding, weld metal in excess of that required for standard fillet and flush butt welds.

—(mesh or welded fabric) Steel rods welded together in pattern for use in concrete paving slabs or bridge sections to keep cracks from opening.

—Steel bars placed in concrete sections for the purpose of adding structural strength.

—**Ratio**—(See ratio of reinforcement.)

**Relative Efficiency of Biplane Wings** (stress analysis)—The ratio of the normal load per square foot on the upper wing to that on the lower.

—**Elongation**—In steel, the increase in length of a bar under stress divided by the original length. The percentage of elongation is gained by multiplying this figure by 100.

—**Humidity**—The ratio of the quantity of water vapor present in the atmosphere to the quantity which would saturate at the existing temperature.

—**Stability**—The ratio, expressed in percentage, of available oxygen in waste waters, sewage, effluent, or diluted sewage to that required to provide bio-chemical oxidation of the organic matters contained therein.

—**Wind**—(aeronautic) (See wind, relative.)

**Relay, Slow Operating**—(See slow operating relay.)

**Relief**—The variation in elevation of the ground surface. On a topographic map it may be indicated by hachures, shading, or more accurately, by contour lines.

**Relief Map**—A model of an area in which its inequalities of surface are shown in relief.

—Term ordinarily used in the United States for Hypsometric Map.

—**Sewer**—A sewer intended to carry a portion of the flow from a district already provided with sewers of insufficient capacity, and thus prevent overtaxing the latter.

**Reline**—To insert a new lining within an existing structure for the purpose of maintaining the opening.

- Relocation**—A new alignment varying from the present location. In road work, curves and hazards are usually corrected.
- Renaissance**—The revival of Classic architecture in Europe during the fifteenth and sixteenth centuries.\*
- Renewals**—Extensive repairs over practically the whole surface of the metaled or paved portion of the highway. (See replacements.)
- Replacement in kind.
- Renversement**—(aeronautic) A maneuver consisting of a half roll and a half loop in the order named.
- Repairs**—The restoration or mending of a considerable amount of the metaled or paved portion of the highway, but not usually of a majority of the surface area. More extensive than "patching," but less so than "renewals."
- Restoration of plant to working condition without increasing value, when some part becomes broken or damaged.
- Repetition**—A process of measuring angles in which the results of successive observations of a single angle are added to each other mechanically on the graduated circle. The multiple angle, or sum angle, is read at the end of the series, and the single angle is obtained by dividing the sum angle by the number of repetitions.
- Rephosphorization**—Adding phosphorus when too much has been removed during the manufacture of steel.
- Replacement**—Property exchanged for some previously existing facility to serve a like purpose.
- Renewal of property in whole or in part; usually a renewal of a part of greater extent or cost than would be represented by a repair.
- Report**—The medium through which information is transmitted and from which records and accounts are prepared or compiled.
- Repose, Angle of**—(See angle of repose.)
- Repressed Lug Brick**—Paving brick in which the lugs are formed by placing the plain wire cut brick in a press.
- Reproduction, Cost of**—(See cost of reproduction.)
- Rerolled Steel**—Although many types of steel and other metals are technically rerolled, this term has come into general use to designate that class of material rolled by the "bundling" or "piling" method under no published standards of quality.
- Reserve Buoyancy** (excess buoyancy)
- The difference between the buoyancy of a completely submerged float and the buoyancy of the float when submerged to the normal-load water line, usually expressed as a percentage of the normal-load buoyancy.
- Reservoir**—A pond, lake, or basin, either natural or artificial, for the storage, regulation, and control of water.
- Residence District**—The territory contiguous to and including a highway not comprising a business district when the property on such a highway for a distance of 300 feet or more is in the main improved with dwellings or dwellings and buildings in use for business.
- Residual Chlorine**—Is the free chlorine remaining in solution after the demand has been satisfied.
- Clay**—A clay deposit formed by the decay of rock in place.
- Shear**—A permanent shear deformation.
- Stress**—In welding, the stress or stresses remaining in a welded joint, welded structure or part cut on completion of welding or cutting.
- Residue**—That portion of an oil or tar which remains in the flask on completion of the distillation test.
- Coke**—The material remaining in crucible on completion of the coke test.

**Resilience, Elastic**—(See elastic resilience.)

**Resistance**—The passive opposition or reaction to any action.

—**Coil**—In electricity, a coil limiting the flow of current.

—**Derivatives**—(See derivatives, resistance.)

—**Of Materials**—That property of bodies, due to molecular forces, by virtue of which they oppose the displacement of their molecules. The opposing force which a body offers to distortion, or to deformation by an external force. Also called the strength of materials. This term is also applied to that branch of mechanics which deals with the phenomena of resistance.

—**Pure**—(See pure resistance.)

—**Structure, Constant**—(See constant resistance structure.)

—**Thermal**—(See thermal resistance.)

—**Volume** (electric)—(See volume resistance.)

—**Wire**—In electricity, a wire composed of a special alloy having a small coefficient of expansion and designed to oppose the flow of electricity.

**Resisting Moment**—The moment which opposes distortion, displacement or overturning. Sometimes used for moment of resistance.

**Resolution**—The resolving of forces into their components.

**Resonance, Displacement**—(See displacement resonance.)

**Resonant Frequency**—In acoustics, a frequency at which resonance exists. The unit is the cycle per second.

**Restitution**—The ability of an elastic body to recover from deformation due to impact.

—**Coefficient of**—(See coefficient of restitution.)

**Resultant Stress**—The stress resulting from combining all the stresses that act on a piece simultaneously.

**Resurfacing**—The renewal of the surface crust or pavement.

**Retaining Wall**—A wall for sustaining the pressure of earth or filling deposited behind it.

—**Buttressed**—(See buttressed retaining wall.)

—**Cellular**—(See cellular retaining wall.)

—**Counterforted**—(See counterforted retaining wall.)

**Retarder**—A compound, usually some form of calcium sulphate, added to Portland cement during manufacture to control the rate of set.

**Retards, Current**—Wire entanglements of full size trees laid parallel and bound together at the trunk end by cables, so placed in a river as to catch drift and thus check the current, causing silting. The shore end of a current retard is anchored to the bank midway of a mattress about 300 feet long, with retard normal to bank and extending in the stream any desired length. Retard in stream is anchored to patented concrete piles sunk below river bed by jetting and driving.

**Retention Period**—Period of holding a liquid in relative quiescence in a tank, channel, or body—as occurs in filling a tank.

—**Specific**—(See specific retention.)

**Reticle** (or **Reticule**) — See diaphragm.

**Retirement**—Act of removing property which for any reason is taken out of service for which it was created or installed; fixed property moved from one valuation section to another.

—**Entry**—In railway valuation, an amount credited to the Investment Account as the ledger value for a unit of property taken out of transportation service.

**Retort**—A container in which a material is placed for treatment either under pressure or in a vacuum or by application of heat so arranged that no gases or liquids escape without control.

**Retractable Landing Gear**—A type

of landing gear which may be withdrawn into the body or wings of an airplane while it is in flight, in order to reduce the parasite drag.

**Retread**—A localized term meaning road-mixed surface for a street or highway.

**Return**—In architecture, the returning of a cornice, belt course or molding around a corner, or into the wall on which it is placed.\*

**Reveal**—In architecture, the inside surface, at right angles to the face of a wall, of an opening. As the distance from the window frame to the face of the wall.\*

**Reverberation** — In architectural acoustics, the persistence of sound, due to repeated reflections.

—**Time**—In architectural acoustics, the reverberation time for a given frequency is the time required for the average sound energy density, initially in a steady state, to decrease, after the source is stopped, to one millionth of its initial value. The unit is the second.

**Reverse Bending**—Running a rope over sheaves placed so that the rope is bent in two opposite directions.

—**Laid Rope**—A wire rope with alternate right and left lay strands.

**Revetment**—The facing of wood, willow mattress, stone, or concrete placed on stream banks to prevent erosion.

—**Wall**—A wall constructed along the toe of an embankment slope to protect the same against erosion.

**Reynolds Number**—(aeronautic) A nondimensional coefficient used as a measure of the dynamic scale of a flow. Its usual form is the frac-

$$\frac{Vl}{\mu}$$
tion  $\frac{Vl}{\mu}$ , in which  $\rho$  is the density

of the fluid,  $V$  is the velocity of the fluid,  $l$  is a linear dimension of a body in the fluid, and  $\mu$  is the coefficient of viscosity of the fluid (cf. scale effect).

**R.F.**—(See rock faced.)

**Rheostat**—A resistance used in connection with the controller for limiting the current taken by the motors, during acceleration. Usually consists of a number of iron grids or strips of iron ribbon properly connected and packed in a substantial frame.

**Rhodochrosite**—A manganese carbonate,  $\text{MnCO}_3$ , containing 38 per cent carbon dioxide, and 62 per cent manganese.

**Rhodonite**—A triclinic silicate,  $\text{MnSiO}_3$ , containing 46 per cent silica and 54 per cent manganese.

**Rhomb Spar**—A synonym for dolomite.

**Rhumb Line**—A curve on the earth's surface which cuts all meridians at the same angle. Its bearing is, therefore, constant. (Also called "Loxodrome," or "Mercator Track.")

**Rhyolite**—The fine-grained equivalent of a granite. It contains quartz, feldspar, mica, etc. The rock is frequently glassy.

**Rib, Wing**—(See wing rib.)

**Rib-Shortening**—The contraction in an arch rib due to the axial stress set up by the loading, or by a decrease in temperature.

**Ridge**—In architecture, the top part of a roof where the roof planes meet.\*

**Ridging**—Making small embankments or borders in fields to control irrigation water.

**Riding Qualities**—In road work, the degree of smoothness furnished by the road structure to the traveling public while passing over it.

**Rifle**—Shallow rapids in an open stream, where the water surface is broken into waves by obstructions wholly or partly submerged.

**Rift**—(of rock) Quarrymen usually refer to the direction of easiest splitting as the "rift."

—**Valley**—A relatively long and narrow trough-like valley formed by

the sinking of a strip of the earth's crust between two approximately parallel and opposed normal faults or zones of faulting.

**Rig** (aerostat)—To attach and adjust the car, rudders, valves, controls, etc., of an airship; i. e., to erect.

—(airplane)—To assemble, adjust, and align the parts of an airplane.

**Rigger**—One who rigs aircraft.

**Right Bank**—That bank of a stream which is on the right when one looks in the direction in which the current flows.

—**Lay** (wire rope)—Same as regular lay.

—**Shore**—The right-hand shore when one is looking down stream.

**Right-Hand Engine**.— (aeronautic) An engine whose propeller shaft, to an observer facing the propeller from the engine end of the shaft, rotates in a clockwise direction.

**Right-of-Way**—The land or water rights necessary for the roadway and its accessories.

—(traffic)— The privilege of the immediate use of the roadway.

—**Map**—A plat representing the actual location and dimensions of the property, franchises or other rights owned or controlled.

**Righting or Restoring Moment**—A moment that tends to restore an aircraft to its previous attitude after any small rotational displacement.

**Rigid Airship**—An airship whose form is maintained by a rigid structure.

—**Body**—A body possessing rigidity or stiffness.

—**Conduit**—A conduit whose cross-sectional shape cannot be distorted sufficiently to change its vertical dimension more than 0.1 per cent without causing materially injurious cracks; including all rectangular conduits and all cylindrical conduits made of plain or reinforced concrete masonry or

pipe or of burnt clay pipes. (Iowa State College.)

**Rigidity, Modulus of**—(See modulus of rigidity.)

**Rill**—A very small channel or stream of water; a rivulet; streamlet.

**Rill-Marks**—Small indentations in shale, limestone, or sand, produced by the eddying of a retreating wave on a beach under the lee of some small obstruction, such as a pebble, or shell.

**Rill-Wash**—The downhill washing of soil materials in a series of minute-branching channels, a process intermediate between slope-wash and stream-flow.

**Ring**—A metal hoop used to bind the head of a pile during driving.

—**Chain**—A chain having rings at the ends and often one or more intermediate ones.

—**Concentration** — **AIRSHIP CONCENTRATION RING**—A ring to which several rigging lines are led from the envelope and from which one or more lines also lead to the car.

**FREE-BALLOON CONCENTRATION RING**—A ring to which are attached the ropes suspending the basket and to which the net is also secured; sometimes called "load ring."

—**Cowling** — (aeronautic) A ring-shaped cowling placed around a radial air-cooled engine to reduce its drag and improve cooling.

—**Dolly**—A dolly having a handle attached to two circular plates. These plates have a series of holes near the circumference on one side and a bucking bar on the other. A tap bolt goes through any of the holes and fastens to the handle, thus placing the bucking bar at any angle required.

—**Exhaust-Collector** — (aeronautic) (See exhaust-collector ring.)

**Ring-Stones**—In stone masonry, the voussoirs that form the end faces of an arch, as distinguished from

the "sheeting stones" that form the body of the arch.

**Rip Cord**—(1) The rope running from the rip panel to the car or basket, the pulling of which tears off or rips the panel and causes immediate deflation of a balloon or a nonrigid airship. (2) The cord, together with the handle and fastening pins, which, when pulled, releases a parachute from its container.

**Riparian Rights**—In appraising, the rights to the free and unobstructed, but not the exclusive use of water, or of the soil or surface thereunder, of a lake, bay, stream, or other body of water in connection with the ownership of a parcel of land under or adjacent thereto.

**Ripple Mark**—The wavy surface of some beds of sandstone and mudstones, produced by gentle movement in shallow water when these rocks were in a soft condition or being deposited.

**Riprap**—Rough stone of various sizes placed compactly or irregularly to prevent scour by water.

**Rise and Fall**—"Rise and fall" is the sum of vertical ascents in rising from a starting point or level to a summit and returning to same point or level, inclusive of all grades on the profile between any two points or terminal. It is mathematically expressed by the formula—Sum of ascents in one direction + sum of descents in same direction  $\div$  2.

**Risers**—A heating term referring to the vertical pipes throughout a building, including the vertical connections to radiators.

**River or Water Gage**—A gage graduated in feet and tenths to give elevation of water surface, with zero below extreme low water and extending above extreme high water.

**Riverwash**—Alluvial deposits in stream beds and flood channels,

subject to erosion and deposition during recurring flood periods.

**Rivet**—A short iron or soft steel rod with a head at one end. It is heated and put into a proper hole, and the other end is hammered down until a suitable head is formed.

—**Countersunk**—A rivet used in countersunk holes in which the point while hot is hammered down to fill the countersinking.

—**Field**—A rivet driven in the field during the erection of a steel structure.

—**Flat-head**—A rivet which has the point hammered flat instead of rounding.

—**Forge**—A small forge used for heating rivets.

—**Grip of**—The thickness of the plates or parts through which the rivet passes.

—**Pitch of**—The distance between the centers of adjacent rivets in the same line.

—**Shop**—A rivet driven in the shop.

—**Snap-Head**—A rivet having its head formed by a snap.

—**Steel**—A soft steel from which rivets are made.

—**Stem**—The shank or that portion of the rivet under the head.

—**Tongs**—Tongs used by field riveters for throwing and placing hot rivets.

**Riveted Girder**—A girder built of plates and angles riveted together throughout.

**Roach**—A heavy jet or vertical sheet of water thrown above the water surface behind a seaplane float.

**Road**—A highway, outside of an urban district.

—**Metal**—Broken stone, gravel, slag or similar material used in road and pavement construction and maintenance.

—**Mix**—A term describing the mixing of mineral aggregate and liquid or fluid bituminous road materials directly on the road bed by means of blade graders, draggs or special

road-mixing equipment. There are three general types of road mix, known as fine, graded, and coarse aggregate types.

**Roadbed**—In railroad use, the finished surface of the roadway upon which the track and ballast rest. —In highway use, the finished surface of the roadway between shoulder lines.

**Roadway**—(railway) That part of the right-of-way of a railway prepared to receive the track. (During construction the roadway is often referred to as the "grade.")

—(highway) The portion of the highway included between the outside lines of gutters or side ditches, including also the appertaining structures and all slopes, ditches, channels, waterways, and appurtenances necessary to proper drainage, protection and use.

—**Completion Report**—In railway work, a report required by Interstate Commerce Commission, Valuation Order No. 3, Second Revised Issue, to show for each project the detailed changes in physical property by units and costs, as included in the Road Accounts.

**Roaster, Blind**—(See blind roaster.)

**Roches Moutonnées**—Rounded hummocks or bosses of rock like whale's back, smoothed and striated by glacial action.

**Rock**—A mass of material, loose or solid, which makes up an integral part of the earth.

—**Asphalt**—A porous rock which has become naturally more or less impregnated with asphalt or maltha. Some examples are, Kentucky rock asphalt, and the Uvalde rock asphalt of Texas.

—**Asphalt Pavements**—Pavements in which the surface course is constructed of natural rock asphalt which has been crushed and in which is sometimes incorporated additional asphalt or flux oil. Asphaltic sandstone is ordinarily laid cold. Asphaltic limestone, either

alone or combined with asphaltic sandstone, is frequently worked up as a hot mixture and laid in much the same manner as sheet asphalt.



*Photo courtesy Uvalde Rock Asphalt Co.  
Uvalde rock asphalt deposit in  
Texas*

—**Faced or "R.F."**—In stone masonry work, this refers to the dressing in which the face shall be an irregular projecting surface without indications of tool marks, with no concave surfaces below the pitch line and with the projections beyond the pitch line not exceeding the figure given on the plans.

—**Fill Dam**—A dam composed of loose rock usually dumped in place; often with the upstream part constructed of hand-placed or derrick-placed rock and faced with rolled earth, or with an impervious surface of concrete, timber, or steel.

—**Salt**—(See halite.)

—**Wool**—A product made from natural rock or from various combinations of natural minerals exploded by hot steam and has the appearance of sheep's wool that has just been clipped. (See mineral wool.)

**Rocker**—A casting supporting the free end of a bridge or truss span, allowing expansion by a rocking motion of the casting.

**Rod, Boring**—(See boring rod.)

—**Float**—A rod or staff designed to

float in a practically vertical position for the purpose of observing velocities.

**Rodded End**—Reinforcement produced by means of enfolding a steel rod within the end of a corrugated metal pipe.

**Roll**—(aeronautic) An angular displacement about an axis parallel to the longitudinal axis of an aircraft.

—(aeronautic)—A maneuver in which a complete revolution about the longitudinal axis is made, the horizontal direction of flight being approximately maintained.

**AILERON ROLL**—A roll in which the motion is largely maintained by forces arising from the displacement of the aileron.

**OUTSIDE ROLL**—A roll executed while flying in the negative angle-of-attack range.

**SNAP ROLL**—A roll executed by a quick movement of the controls, in which the motion is largely maintained by autorotational couples on the wings.

**Rolled Steel**—Steel that has been cast into ingots and then passed through a succession of rolls until the desired final shape is obtained.

**Roller Gate**—A hollow cylindrical gate with spur gears at each end meshing with an inclined rock anchored to a recess in the end pier or wall. It is raised or lowered by being rolled on the rock.

**Rolling**—(aeronautic) Angular motion about the longitudinal axis.

**Rollway**—The overflow portion of a dam; an overflow spillway.

**Romanesque**—A style of architecture prevalent in Western Europe from the ninth to the twelfth century, founded on Roman architecture.\*

**Roof Truss**—Any truss used in supporting a roof.

**Roofing Slag**—(See slag roofing granules.)

**Root**—In welding, the zone at the

bottom of the cross-sectional space provided to contain a fusion weld.

—**Edge**—In welding, the joint edge at the bottom of the cross-sectional space provided to contain a fusion weld.

—**Face**—In welding, a joint surface of relatively small dimensions at the bottom of the cross-sectional space provided to contain a weld.

—**Propeller**—(aeronautic) (See propeller root.)

—**Zone**—The stratum of soil invaded by the roots of plants.

**Roots-Type Supercharger**—(aeronautic) A positive-displacement rotary blower consisting of two double-lobed impellers turning in opposite directions on parallel shafts within a housing, the impellers rolling together except for a small clearance, meanwhile alternately trapping incoming air or mixture in the ends of the housing and sweeping it through to the outlet.

**Rope Clamps**—A fastening for wire rope consisting of two grooved side plates connected by bolts which clamp the sides together.

—**Clip**—A fastening for wire rope consisting of a "U" bolt with nuts and a saddle.

—**Drive**—A means of transmitting power between two shafts using rope instead of belting or chain.

—**Laid**—A term applied to a rope composed of several small ropes laid together.

**Rosiwal's Method**—In petrography, a method of determining the percentages (by volume) of the minerals in a rock, by measuring with an eye-piece micrometer the linear intercepts of each mineral, as seen in thin section along a line suitably distributed over the section.

**Rotary Compressor**—(See turbo.)

—**Pump**—A positive displacement pump with a fixed casing containing the rotating element or elements consisting of gears, cams, screws, vanes, or modification of

these elements. They are positive displacement pumps, therefore are suitable for handling thick and viscous liquids which are difficult to handle with other types of pumps; they have close mechanical clearances or mechanical contact between parts which makes them most suitable for handling (a) liquids that lubricate, such as petroleum products, vegetable oils, greases, soap, etc., and (b) liquids having a high vapor pressure such as gasoline, benzine, etc.; they are self-priming because of their positive displacement action and therefore find many applications where the pumping problem is on the suction side of the pump, such as priming units for centrifugal pumps, ice plant core water units, and vacuum services of various kinds.

- Pumps**—(for high temperatures) For handling materials having a temperature of 450 deg. F. or higher, cast or forged steel pumps are recommended. This is in accord with the recommendation of the A.S.M.E.
- Resistance Derivatives**—Resistance derivatives expressing the variation of moments and forces due to small changes in the rotational velocities of the aircraft.
- Snow Plow**—In railroad use, a car having at the front end a bladed wheel, set at right angles with the track and driven by an engine on the car, which, as the car is pushed forward by a locomotive, cuts the snow from before the plow and discharges it to one side of the track.
- In highway use, a rotating set of blades mounted on the front end of a truck or tractor ahead of a V-plate or a flat plate and driven by a separate motor for the purpose of throwing snow off the roadway.
- Tidal Current**—The type of current in the ocean's offshore. These currents do not slack and reverse but change direction continually, passing through all points of the compass in a tidal cycle of 12 hours and 25 minutes.
- Rotating Cantilever Draw, Double**—(See double rotating cantilever draw.)
  - (in irrigation)—A system of irrigation through which the irrigator receives his allotted quantity of water, not at a continuous rate, but as a large flow at stated intervals; for example, a number of irrigators receiving water from the same lateral may agree among themselves to rotate the water, each taking the entire flow in turn for a limited period.
  - Element**—The rotating element is understood to consist of the shaft, shaft sleeves and distance sleeves when used, impeller and all other parts that rotate, including the pump half coupling.
  - (assembled) An assembled rotating element is understood to consist of a shaft, shaft sleeves and distance sleeves when used, impeller and all other parts that rotate, including the pump half coupling, also all stationary parts that must be assembled at time of assembly on shaft.
  - (close coupled pump)—The rotating element is understood to consist of the rotor shaft (with electrical element assembled in place) two bearings, shaft sleeve and distance sleeve when used, impeller and all other parts that revolve.
- Rotation**—Turning around on an axis or center. Rotary motion.
- Axis of**—A line passing through the center of rotation and perpendicular to the plane of rotation.
- Rotor**—In electricity, the rotating part of a motor or generator.
- (aeronautic) The complete rotating portion of a rotary wing system.
- Plane**—A form of aircraft whose support in the air is chiefly de-

rived from the vertical component of the force produced by rotating airfoils.

**Rottenstone**—A soft, light, earthy substance consisting of silica in fine grains, resulting from the decomposition of siliceous limestone.

**Rotunda**—In architecture, the circular space under a dome.\*

**Rough Grade**—First stages of grading operation, within 0.5 ft. of designed grade line, in making the cuts and embankments of a road-bed.

—**Pointed**—Having irregular surface, the variations of which do not exceed  $\frac{1}{2}$  inch from the pitch line.

**Roughing Tank**—Tank in which sewage is held for a short time to remove coarse suspended matter or greases. If roughing tank is used, Primary and Preliminary are interchangeable.

**Roughness, Coefficient of**—(See coefficient of roughness.)

**Roughometer**—A machine for testing road surfaces, as to riding qualities.

**Rounds**—Round bars in the bracing system of a highway bridge. The rungs of a ladder.

**Rubbed**—A fine finish made by rubbing with grit or sandstone.

—**Finish**—Having surface treated by rubbing with carborundum or cement bricks, or wooden floats to remove all form marks and irregularities.

**Rubble**—Rough stones of irregular shapes and sizes, broken from larger masses either naturally or artificially, as by geological action, in quarrying, or in stone cutting or blasting. When it is of a large or massive size, it is termed block rubble.

—**Coursed**—(See coursed rubble.)

—**Dam** (dry)—A dam made from unmortared rubble.

—**Gutter, Grouted**—(See grouted rubble gutter.)

**Rudder**—A hinged or movable auxiliary airfoil on an aircraft, the

function of which is to impress a yawing moment on the aircraft.

—**Angle**—The acute angle between the rudder and the plane of symmetry of the aircraft. It is positive when the trailing edge has moved to the left with reference to the normal position of the pilot.

—**Bar**—(aeronautic) The foot bar by means of which the control cables leading to the rudder are operated.

—**Pedals**—(aeronautic) The foot pedals by means of which the controls leading to the rudder are operated.

**Rueping Process**—An empty cell process for treating with creosote in which the following sequence is used: Compressed air; cylinder filled with reducing pressure; pressure held until required absorption is obtained; final vacuum.

**Run of Kiln Lime**—Quicklime as drawn or discharged from the kiln without screening, picking or selection of any kind.

—(or rolling) **Of Rail Steel**—Used in connection with rail steel manufacture, a "run" or "rolling" designates an uninterrupted rolling of one size of bar from rails of one nominal size. Also used to designate the material produced in such a rolling. A "run" to rail steel is the same as a "heat" to billet steel, both being terms of manufacture identity.

**Running Rail**—In railway use, the rail or surface on which the tread of the wheel bears.

—**Rope**—A flexible rope used on ships and in construction work for auxiliary purposes.

—An extra lifting rope as distinguished from the load line.

**Runoff**—The term applied to that part of the precipitation which is carried off from the land or area upon which it falls.

—That part of the precipitation which reaches a stream, drain or sewer.

—The rate of surface discharge of the above.

- Coefficient**—The ratio, expressed decimally, of run-off to precipitation.
- Percentage**—The amount of run-off expressed in per cent of the total rainfall on a given area.
- Rate**—An expression of the rate at which rainfall runs off from a surface, expressed in inches in depth of rainfall per hour, cubic feet per second, or other units.
- Runouts (or Radiator Runouts)**—A heating term referring to pipes connecting the base of the vertical connections for radiators with the risers or mains.
- Runway**—An artificial landing strip permitting the landing and take-off of airplanes under all weather conditions.
- Localizing Beacon**—A small radio-range beacon giving accurate lateral direction along the runway of an airport or landing field and a few miles beyond.
- Rupture Load**—The load at which a piece fractures or breaks.
- Strength**—The value obtained by dividing the breaking load of a material under test by the original cross-sectional area.
- Rust**—An oxidation of a metal.
- Rustication**—In architecture, heavily recessed joints. Gives the appearance of strength and dignity.\*
- Rutile**—A titanium mineral,  $\text{TiO}_2$ , containing 40 per cent oxygen and 60 per cent titanium.

# S

**S-iron**—A piece of flat iron, sharpened on one edge and bent to the shape of the letter S, used for driving into the end of a piece of timber to prevent splitting and checking.

**Sabin**—In architectural acoustics, the sabin is a unit of equivalent absorption and is equal to the equivalent absorption of one square foot of a surface of unit absorptivity; i. e., of one square foot of surface which absorbs all incident sound energy.

**Saccharoidal**—A term given to sandstones whose texture resembles that of sugar.

**Saddle Back**—A hill or ridge having a concave outline at the top.

**Safety, Factor of**—(aeronautic) (See factor of safety.)

—**Rails**—A railing usually made of iron pipe applied to a motor car or trailer to serve as hand hold for occupants of a car as a means of safety.

—**Zone**—The area or space officially set apart within a roadway for the exclusive use of pedestrians and which is protected or is so marked or indicated by adequate signs as to be plainly visible at all times while set apart as a safety zone.

**Sag**—The deflection or dip in a suspended span of rope.

—A small valley between ranges of low hills.

—A deflection below two horizontal points.

**Sailplane**—A performance-type glider.

**Sal Ammoniac**—Ammonium chloride,  $\text{NH}_4\text{Cl}$ .

**Salimeter**—An instrument for measuring the amount of salt in a solution.

**Salt**—Any substance which yields ions, other than hydrogen or hydroxyl ions. A salt is obtained by

displacing the hydrogen of an acid by a metal.

**Salt Dome**—These domes are formed by strata being lifted or swollen upward by the increase in volume of salt and sulphur during deposition.

—**Horse**—Quarrymen's term for apolite or other useless rock.

**Salt peter**—Potassium nitrate. One of the chief ingredients of black blasting powder.

—**Chile**—Sodium nitrate.

**Salvage**—The value of material recovered from property retired or from property after use as a construction aid.

—**Value**—In engineering economics, the price that is realized from the sale of a depreciated machine or structure.

**Sample**—In materials, a part of anything presented as evidence of the quality of the whole.

—**Thief**—Apparatus for taking samples of preservatives from tanks or other containers.

**Sand**—The fine granular material (usually less than  $\frac{1}{4}$  inch in size and larger than the 200 mesh sieve) resulting from the natural disintegration of rock, or from the crushing of friable sandstone rocks.

—In geology, separate grains or particles of detrital rock material, easily distinguishable by the unaided eye, but not large enough to be called pebbles.

—**Asphalt**—Is either: 1. a hot-laid plant mix mixture of local sand and asphalt cement prepared without special control of aggregate grading; or 2. a mixture of local sand, with or without mineral filler and a liquid asphaltic material. In the latter case either road mix or plant mix construction may be em-

ployed. Sand-asphalt is used in low-cost construction for both base and surface courses. It is known as the fine aggregate type of mixture.

**Sand Blast Finish**—Having surface formed by the wearing effect of the sand blast.

—**Boil**—Ebullition of water behind levees, fed by channel through or under levee, generally latter.

—**Clay**—(road surface) A surface composed of a mixture of sand and clay where the two materials have been blended, so that their opposite qualities tend to maintain a condition of stability under varying moisture content. Some deposits are found in nature, but the bulk of such surfaces are prepared artificially.

—**Filter**—A filter in which sand is the filtering medium. (See also intermittent filter.)

—**Glass**—(See glass sand.)

—**Line**—Rope used for removing the sand and fluid from deep wells while being drilled with cable tools.

—**Seams**—Quarry term for more or less minute veins or dikes of muscovite (white mica) with some quartz, in cases also with feldspar.

—**Trap**—A device, often a simple enlargement in a conduit for arresting the sand, silt, etc., carried by the water, and generally including means of ejecting such material from the conduit.

—**Streaks**—A quarryman's term for sand seams.

**Sandbag Line**—A rope extending along the line of suspension ropes or bridles of a kite balloon to which are hooked the sandbags used in mooring the balloon. The purpose is to prevent wear on the suspension cordage.

**Sand-Binding Plant**—Any plant adapted to growth on shifting sand and effective in holding the sand in place.



*Sand-clay pit in Maryland*

**Sanding**—Applying sand to a surface to improve traction.

**Sandstone**—A typical sandstone is composed essentially of rounded grains of quartz, with or without interstitial cementing material, with the larger grains tending to be more perfectly rounded than the smaller ones. The fracture in sandstones takes place usually in the cement, leaving the grains outstanding, thus giving the rock the appearance and feeling of loaf sugar.

—**Argillaceous**—(See Argillaceous sandstone.)

—**Ferruginous**—(See ferruginous sandstone.)

**Sandy Loam**—A sandy loam is a soil containing much sand but having enough silt and clay to make it somewhat coherent. The individual sand grains can readily be seen and felt. Squeezed when dry, it will form a cast which will readily fall apart, but if squeezed when moist a cast can be formed that will bear careful handling without breaking. Sands and sandy loams are classed as coarse, medium, fine, or very fine, depending on the proportion of the different sized particles that are present.

**Sanidine**—A glassy variety of orthoclase feldspar.

**Sanitary Sewage**—Sewage originat-

- ing** In the sanitary conveniences of a dwelling, business building, factory, or institution.
- Sewer**—A sewer which carries domestic sewage only; excluding storm, surface, and ground water, and trade wastes.
- Sap**—Quarrymen's term for ferruginous discoloration along sheet or joint surfaces.
- In botany, the fluid circulation in a tree or plant.
- In military, a tunnel dug out under an object for the purpose of dynamiting the object.
- Drum**—In wood preservation, a small tank or drum located below treating cylinder for collecting sap or condensation during steaming.
- Stain**—Discoloration of sapwood by certain fungi which live upon the materials in the sapwood cells. Does not seriously impair the strength of timber.
- Sappino**—In geology, the natural processes by which cliffs are undermined by the wearing back of the softer layers.
- Sapwood**—The outer portion of a tree, exclusive of bark, in which the wood cells are alive and perform vital functions.
- Saprolite**—Weathered (rotten) rock in situ.
- Sash Brace**—A horizontal member secured to the posts or piles of a bent.
- Satin Spar**—A fibrous silky variety of aragonite or of gypsum.
- Saturation**—The condition of a liquid when it has taken into solution the maximum possible quantity of a given substance at a given temperature and pressure; as water saturated with oxygen.
- Zone of**—The permeable rocks below a certain level are generally saturated with water. These saturated rocks constitute the "zone of saturation."
- Sausage Dam**—A wire-wrapped, loose-rock dam where the resulting bundles are like cylinders and are laid in a horizontal or vertical position.
- Saw, Hot**—(See hot saw.)
- Scabbled**—Having irregular surface, the variations of which do not exceed  $\frac{3}{4}$  inch from the pitch line. Hammer dressed.
- Scagliola**—A composition imitating marble.\*
- Scale**—A mechanical device for weighing.
- Ratio of any length on a map to the length of the corresponding line on the ground. In common usage the scale of a map is usually stated in terms of the "equivalent scale"; as, "1 in. (on map) equals 40 ft. (on ground)." It may also be expressed as a fraction ("representative fraction," abbreviated R.F.), as 1 to 5,000, or  $1/5,000$ . Stated in this way the scale is, of course, independent of units, and applies equally well to feet, meters, or any other unit. A scale may also be indicated graphically by a line and properly subdivided ("graphical scale").
- Approximate**—(aerial photography) The ratio of the focal length of the camera to the elevation of the lens above the mean ground surface. Strictly speaking, an aerial photograph can have a uniform scale value throughout only in the event that both the ground surface and the focal plane of the camera are horizontal, conditions which are not encountered in practice, owing to the inevitable relief of the terrain and the tilt of the camera. An oblique aerial photograph has an infinite number of scales.
- Effect**—(aeronautic) The change in any force coefficient, such as the drag coefficient, due to a change in the value of Reynolds Number.
- Fusibility**—(See fusibility scale.)
- Hammer**—A scale of oxide which forms on bars when heated.

- Iron**—A loose coating of oxide which forms on heated iron during the process of forging.
- Scaling, Manipulation**—(of concrete) Is found on pavements in very thin layers like sheets of cardboard. It usually occurs only in a single layer, but sometimes in two or more layers extending to a depth of 1/16 to 1/4 inch.
- Progressive**—(of concrete) Is characterized by the fact that it continues deeper and deeper into the mass. This type of scaling is really an exfoliation of the surface.
- Surface**—Surface scaling of concrete may be of several types representing many causes. The following types can be recognized: (a) Manipulation scaling, (b) frost scaling, (c) progressive scaling.
- Scalping**—The process of removing heavy sods or other vegetation from the slopes and ditches of natural ground or old roadway before embankment is started.
- Scapolite**—A group of minerals usually white in color, and consist essentially of silicates with varying amounts of aluminum, calcium, and sodium.
- Scarified (seed)**—(See unscarified.)
- Scarify**—To loosen or disturb superficially.
- Schistosity**—The quality of being like a schist (rock).
- Schists**—Differ from gneisses in being of finer grain, and in possessing a well-marked tendency to split into thin layers, except when puckered or folded by movement subsequent to the development of schistosity. Some examples of schists are, mica schist, sericite schist, etc.
- School, Ground**—(aeronautic) A school in which instruction is given to a student undergoing flight training.
- Schorl, White**—(See white schorl.)
- Schwedler Truss**—A modification of the Whipple truss.
- Sclerometer**—An instrument for determining the degree of hardness of a mineral by ascertaining the pressure on a moving diamond point necessary to effect a scratch.
- Scoop, Air**—(See air scoop.)
- Score Mark**—A mark made by the axe as an aid in hewing a tie.
- Scoria**—Is applied to lava in which the gas cavities are numerous and irregular in shape. The escape of the gas distends the molten material which produces the cavities.
- Scoring Machine, Tie**—A portable power-operated railway machine provided with two circular saws designed to saw the face of railway track ties to uniform width and depth as a guide for hand adze work to provide a proper bearing for rail or tie plates in relay track work.
- Scotia**—In architecture, a compound curve of concaved section, used in the base of some columns.\*
- Scour**—Erosion or abrasion produced in connection with flowing water.
- Scouring Sluice**—In soil conservation, an opening in a dam controlled by a gate through which the accumulated silt, sand, and gravel may be ejected.
- Scow Factor**—(dredge work) Ratio between cubic contents of scow level full and actual cubic yards in scow. This ratio varies for material, locality and dredging method.
- Measurement**—(dredge work) Excavation measured by taking number of scow loads and estimated cubic yards in scow.
- Scrap**—Discarded material; junk.
- Scraper, Slackline**—(See slackline scraper.)
- Screed**—Mechanically operated strike-off unit designed to the proper crown or surface cross section, which removes excess material ahead of it as it progresses across a surface.
- Screen**—In laboratory work, an apparatus, in which the apertures are

- circular, for separating sizes of material.
- (sewage)—A device with openings, generally of uniform size, used to retain coarse sewage solids. The screening element may consist of parallel bars, rods, or wires, grating, wire mesh, or perforated plate, and the openings may be of any shape, generally circular, or rectangular slots.
- A curtain with openings to catch floating debris, control movements of fish, etc.
- Screening**—The removal of relatively coarse floating and suspended solids by straining through racks or screens made of bars, gratings, wires, or perforated plates.
- Screenings**—Broken rock, including the dust, of a size that will pass through one-half to a three-quarter inch screen, depending upon the character of the stone.
- The material removed from sewage by screens.
- Screens**—In sewage technology, a device containing openings of proper size to retain a part of the suspended matter of sewage.
- Screw or Propeller, Pump, Centrifugal**—(See centrifugal screw or propeller pump.)
- Scribe**—To trim off the edge of a board, etc., so as to make it fit closely at all points to a certain line.
- Scriber**—A sharp-pointed tool for marking metal.
- Scrubbed Finish**—Having a surface formed by rubbing or scrubbing to expose the aggregate.
- Scum**—A floating mass of sewage solids buoyed up in part by entrained gas or grease, forming a greasy mat which remains on the surface of the sewage.
- Board**—A vertical baffle dipping below the surface of sewage in a tank to prevent passage of floating matter.
- Scupper**—An opening, usually of cast iron, in the gutter of the pavement, for draining the roadway.
- Scurf**—To flake off, or the material which flakes off. Dross.
- Sea Buoy**—The first buoy encountered coming from the sea, marking the channel entrance to a harbor. Red, left; black, right.
- Seal Coat**—A very light application of thin bituminous material given to a bituminous surface to penetrate into the mat, fill its voids, seal off surface water and more thoroughly bond the surface particles. Preferably no cover material is used, the sealing bitumen being of a type that will satisfactorily maintain the non-skidding resistance of the original surface. If cover is used it is negligible in amount, simply providing enough aggregate particles to prevent excessive pick-up by traffic.
- Seale**—A nineteen wire strand construction, an arrangement of wires, nine around nine around one.
- Sea Level**—See Mean Sea Level.
- Seam**—In rock work, quarrymen's term for joint.
- In steel work, a junction of two adjacent plates either riveted, welded or bolted together.
- Face**—(See split or seam face.)
- Seaplane**—An airplane designed to rise from and alight on the water.
- Hull**—That portion of a flying boat which furnishes buoyancy when in contact with the surface of the water. It contains accommodations for the crew and passengers, usually combining the functions of both float and fuselage.
- Seasoning**—Process of removing the natural moisture of wood therefrom by exposure to air or by artificial means.
- Permitting volatiles to evaporate from bituminous mixtures.
- Artificial** — Removing moisture from wood by means other than air drying.
- Oil**—Seasoning wood artificially

- by keeping it submerged in oil heated to a temperature above the boiling point of water, either at atmospheric pressure or at reduced pressure.
- Steam**—Preparing green timber for treatment by subjecting it to the action of steam in a closed cylinder.
- Seawall**—A barrier along the shore line to prevent encroachment of the sea by direct wave action.
- Second**—(in time) The sixtieth part of a minute;  $1/86400$  of a mean solar day.
- (in circular measure)  $0.000004$  radian.
- Second-Foot**—A cubic foot per second; a cusec.
- Second-Foot Day**—The volume of water represented by a flow of 1 cu. ft. per second for 24 hours. It is 86,400 cu. ft., or practically 2 acre-ft., a convenient unit in storage computations.
- Secondary Clay**—Clay found deposited away from its place of formation.
- Current**—In electricity, the induced current, as that flowing in the output side of a transformer.
- Minerals**—Mineral whose presence is due to the alteration of the original minerals.
- Shear Wire**—(aeronautic) An additional reinforcing shear wire.
- Stress**—An indirect stress set up by the deformation of a member caused by primary stresses.
- Truss**—A truss supported by another truss.
- Secondary-Type Glider**—A glider designed to have better aerodynamic performance than the primary type, but rugged enough for the use of pilots with limited training.
- Secretions**—In petrology, a general term applied to all materials which have been deposited from solution by infiltration in the cavities of rocks.
- Section**—A unit portion or part of a whole. In surveying, an area of land bounded on four sides by a distance of one mile each. One thirty-sixth part of a normal township.
- Modulus**—The moment of inertia of the area of a section of a member divided by the distance from the center of gravity to the outmost fiber.
- Sector Gate**—A roller type of gate in which the roller is a sector of a circle instead of a complete cylinder.
- Securities, Listed**—(See listed securities.)
- Sedentary**—Formed in place, without transportation, by the disintegration of the underlying rock or by the accumulation of organic material.
- Sedges**—Used in roadside development to refer to the large grass-like herbs, often growing in dense tufts in marshy places.
- Sediment**—Earthen material carried by a stream in suspension.
- Sedimentary Rocks**—Are formed by the decay of existing strata with subsequent deposition of the solid material that has been carried in suspension by agencies of transportation to some point where they have been redeposited.
- Sedimentation**—The subsidence and deposition of suspended matter in a liquid by gravity.
- (sewage)—A tank or basin in which sewage, partly treated sewage, or other liquid containing settleable solids, is retained long enough, and in which the velocity is low enough, to bring about sedimentation of a part of the suspended matter, but without sufficient detention period to produce anaerobic decomposition.
- Tank**—A tank for the removal of suspended matter either by quiescent settlement or by continuous flow at such a velocity and time of retention as to allow deposition of suspended matter.

**Seeded Slopes**—A term used in roadside development to refer to slopes on which grass, legumes, or other low herb-like plants have been established by seeding methods.

**Seep Water**—Water which has passed through or under a levee or dam.

**Seepage**—Water escaping through or emerging from the ground along some rather extensive line or surface as contrasted with a spring the water of which emerges from a single spot. A soaking through from underneath.

—(in irrigation)—The flow of water from a canal or reservoir by percolation, expressed as depth over the surface or wetted perimeter in a given time.

**Segmental Arch**—(See arch segmental.)

**Segregation**—In geology, the scientific term for "knot," a collection of material separated from other material. A vein of segregation is one formed by the filling of a fissure with mineral matter originating in the surrounding rock.

—Separation of sizes or parts.

—**Negative**—The condition existing where any part of an ingot or casting has less than the average amount of carbon and impurities.

—**Positive**—The concentration of the carbon and impurities (in solution) in that part of an ingot or other casting which solidifies last.

**Seismology**—Investigation of earth vibration augmented by studies of pertinent aspects of physical theory.

**Seize**—To bind by wrapping with wire or marlin.

**Selected Crushed Lime**—The product resulting from the mechanical crushing or grinding of screened or selected quicklime to a particle size which varies according to a definite specification or use.

**Selective Removal**—(of trees) In roadside development, the cutting, grubbing out or removal of road-

side trees which are selected for removal because of disease, ill form, unhealthy condition and other undesirable qualities.

**Selenite**—Gypsum in distinct crystals or broad folia,  $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ .

—**Plate**—In mineralogy, a plate of selenite which gives a purplish interference color of the first order with crossed nicols.

**Selenium Cell**—A cell consisting of a mass of selenium fused in between two conducting wires or electrodes of platinized silver or other suitable metal.

**Self-Cleaning Car**—A car having a floor forming one or more hoppers, with doors at the bottom which, when opened, permit the load to discharge by gravity. Hopper cars, ballast cars, side dump cars, etc., are generally self-cleaning.

**Self-Mulching Soil**—A soil that breaks up into fine, dry dust by cultivation, forming a mulch.

**Semi-Arid**—A term applied to a country not entirely arid nor strictly humid, but intermediate. A dry-farming country in which many crops grow without irrigation, but in which far better yield results from irrigation.

**Semi-Cantilevering**—A method of erecting a simple span without falsework, by suspending members out from an adjacent span, or adjacent spans, and afterward removing the suspending members so as to leave the simple span as the final structure.

**Semi-Circumferential Flow**—Flow parallel to the semi-circumferences of a circular tank, divided at the inlet and meeting again at the common outlet.

**Semi-diurnal Force**—The tide-producing force having a period of approximately one-half day. The semi-diurnal forces are the principal tide-producing forces.

—**Or Semi-daily Tide**—A tide in which two high and two low wat-

- ers occur each day, but with little diurnal inequality.
- Semi-Matte Print**—(photography) A non-glossy paper with only a faintly lustrous surface.
- Semirigid Airship**—An airship whose shape is maintained by means of a rigid or jointed keel in conjunction with internal pressure in the gas containers and ballonets.
- Sensible Heat**—In heating and air conditioning, the heat that raises the temperature of a body which absorbs it. It is measured by a standard thermometer.
- Separate Sewer**—A sewer which is intended to receive only sewage and not storm or surface water.
- Sludge Digestion**—The digestion of sludge in tanks entirely independent from the tanks in which it is produced.
- System**—A system of sewers in which sewage and storm water are carried in separate conduits.
- Separation**—(aeronautic) The phenomenon in which the flow past a body placed in a moving stream of fluid separates from the surface of the body.
- Point**—(aeronautic) The point at which the separation of the boundary layer begins.
- Septic Sewage**—Stale sewage in which the organic decomposition has reached the stage of evolving hydrogen sulfide.
- Tank**—A settling tank intended to retain the sludge in immediate contact with the sewage flowing through the tank for a sufficient period to secure a satisfactory decomposition of organic solids by anaerobic bacterial action.
- Serial Bond**—Bond redeemed at regular intervals during the life of the issue.
- Sericite**—A more or less fibrous form of muscovite (potash mica), often resulting from the alteration of feldspar.
- Sericitisation**—In petrology, the hydrothermal or other processes whereby aluminosilicate minerals are replaced by sericite.
- Serpentine**—In mineralogy, a hydrous magnesium silicate, commonly green, greenish-yellow, or greenish-gray, and massive, fibrous, lamellar, or occurring as pseudomorphs.
- In petrology, a metamorphic rock composed chiefly or wholly of the mineral serpentine.
- Serve**—As a cable, to wrap closely with marlin, wire or strand.
- Service Ceiling**—(aeronautic) The height above sea level, under standard air conditions, at which a given airplane is unable to climb faster than a small specified rate (100 feet per minute in the United States and England). This specified rate may differ in different countries.
- Pipe Line**—(See pipe line, service.)
- Servo Control**—(See control, servo.)
- Sesquiplane**—A form of biplane in which the area of one wing is less than half the area of the other.
- Set**—(noun) The change from a plastic to a solid or hard state.
- Final**—The condition of a plastic mix which has changed to a firm or solid state; applies to time required to complete "stiffening" process or crystallization.
- Permanent**—(See permanent set.)
- Set-Back**—In base-line measurement, the distance by which the reference mark on a measuring plate is set back so that the end mark of the tape will fall on the next measuring plate.
- Setting Up**—The relatively quick change such as takes place in Portland cement mixtures, or other mortars, or in a bituminous material after its deposition in place, indicated by its hardening after cooling and exposure to atmospheric conditions, as opposed to the slower changes later occurring gradually and almost imperceptibly.

**Set-Up**—(transit or level) The instrument placed in position and leveled, ready for taking measurements; or, a point where an instrument is to be or has been placed.

—(base-line measurement) Distance by which the reference mark on a measuring plate is set ahead so that the end-mark of the tape will fall on the next plate.

**Settleable Solids**—Suspended solids which will settle under quiescent conditions in a given time, usually two hours. (See non-settleable solids.)

**Settled Sewage**—Sewage from which some of the solids have settled out in a tank during quiescence or slow flow.

**Settling Basin**—An enlargement in a stream to permit the settlement of debris carried in suspension, usually provided with means of ejecting the material so collected; a form of sand trap.

—A large tank of quiescent liquid in which the flow velocity has been reduced to the point that solids will separate out and be deposited on the bottom of the tank.

—**Solids**—Those suspended matters which will subside in quiescent sewage in any specified length of time.

**Settlement**—(noun) The term settlement as applied to grading material is the reduction in elevation of an embankment caused by shrinkage or subsidence.

**Sewage**—The spent water supply containing the wastes from domestic, industrial or commercial use, including such surface and ground water as may enter the sewer.

—**Disposal**—A generic term applied to the act of disposing of sewage matter by any method.

—**Farm**—An area of land on which crops are raised to which sewage is applied on or beneath the surface of the soil and is absorbed

by vegetation, evaporates or percolates to the ground water.

—**Oxidation**—The process whereby through the agency of bacteria, in the presence of air, the organic matter is converted to a more stable condition or into mineral matter.

—**Purification**—The removal or mineralization of all putrescible organic matter and the removal of all infectious and offensive matter in sewage. Loosely used for sewage treatment.

—**Stale**—Sewage which at the point of examination does not contain dissolved oxygen.

—**Treatment**—Any artificial process to which sewage is subjected in order to remove or so alter its objectionable constituents as to render it less offensive or dangerous.

—**Treatment Works**—Treatment plant and means of disposal.

—**Weak**—(See weak sewage.)

**Sewer**—A conduit for carrying sewage.

—**Appurtenances**—Constructions, devices, and appliances other than the pipe or conduit, which are appurtenant to a sewer, such as man-holes, flush tanks, surface inlets, etc.

—**Common**—(See common sewer.)

—**District**—The area deemed benefited by the construction and use of sewers.

—**Outfall**—The structure at the lower end of an outfall sewer.

—**System**—The collecting system of sewers and appurtenances, together with such small pumping stations as may be required to lift the sewage from low-level districts.

**Sewerage**—The engineering of the collection, treatment, and disposal of water-borne domestic, industrial, and trade wastes. The wastes also are often, albeit loosely, referred to as sewerage.

—**Works**—The sewer system, main pumping stations, treatment works,

means of disposal of effluent and sludge, and all other works necessary to the complete collection, treatment and disposal of the sewage.

**Shackle**—A "U" shaped piece of round steel bridged by a removable pin. Used for making a detachable fastening.

**Shade**—A term descriptive of that difference between colors which results from a difference in luminosity only, the other color constants being essentially equal. A darker shade of a color is one that has a lower luminosity.

**Shaft**—A pit or well sunk from the ground surface above into a tunnel for the purpose of furnishing ventilation or for facilitating the work by increasing the number of points from which it may be carried on.  
—(architectural) That part of a column between the base and the capital.

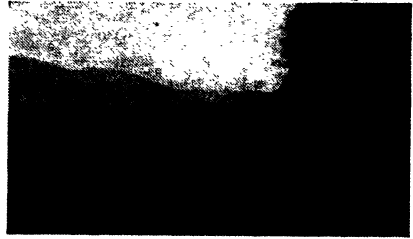
—A vertical opening or pit sunk comparatively deep into the earth, or in the framework of a structure.  
—A tall masonry structure of regular dimensions in which the width of a side is a small proportion of the height.

—(aeronautic) **CLIMBING SHAFT**

—A shaft, fitted with a ladder, which leads from the bottom to the top of an airship hull to provide access to the upper portion.  
**GAS SHAFT**—A passageway between the gas cells of an airship to permit the escape of gas which has been discharged from the cells.

**Shake**—The lengthy separation of wood, which usually occurs between and parallel to the rings of annual growth.

**Shale**—A material composed essentially of silica and alumina, which has, in addition a more or less thinly laminated structure. This structure has been imparted by the natural stratification of extremely fine sediments together with more or less pressure.



*Photo courtesy West Virginia State Road Commission*

*Shale surfaced road near Romney, W. Va.*

—**Alum**—(See alum-shale.)

—**Oil**—(See oil shale.)

**Shaly**—A term applied to thinly bedded rocks in which the layers are separated by thin leaves of shale.

**Shape**—Any rolled beam or bar used in a structure.

**Shaper**—A machine tool for planing or finishing metal.

**Shaping**—Trimming up and preparing a subgrade preparatory to applying the first course of the road metal or artificial foundation.

**Sharp-crested Weir**—(hydraulics) A notch cut in a relatively thin plate and having a sharp edge on the upstream side of the crest.

**Shear**—To slide one part of a body upon an adjacent part.

—The stress set up in opposition to a shearing action.

—**Counter**—(See counter shear.)

—**Double**—(See double shear.)

—**End**—The shear at the end of a beam or girder.

—**Longitudinal** — (See longitudinal shear.)

—**Steel**—Steel made in the form of bars from blister steel by cutting the latter into short lengths, piling these upon each other and heating, and welding them by rolling or hammering into one piece.

—**Zone**—In geology, a zone in which shearing has occurred on a large

scale, so that the rock is crushed and brecciated.

**Shearing Machine**—A machine for shearing metal, consisting of a movable jaw-cutter operating against a fixed cutting edge.

**Shears**—A frame guyed upright for raising loads by means of a rope tackle.

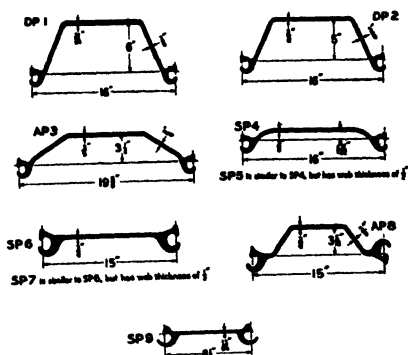
**Sheathing, Lead**—(See lead sheathing.)

**Shed, Airship**—(See dock.)

**Shed Asphalt**—A mixture of asphalt cement with graded sand passing the 10-inch sieve and mineral filler. It is laid hot. Its use is ordinarily confined to surface course construction and it is most frequently laid on a binder course.

—**Erosion**—In soil conservation, the removal of a more or less uniform layer of material from a portion of the land surface by processes of slope-wash, sheet flood, etc.; contrasted to gullying and fluvial erosion which act only along drainage lines.

—**Pavement**—A pavement free from frequent joints such as would accompany small slabs or blocks, and which has an appreciable thickness (say, in excess of one inch on the average) for its wearing course.



*Photo courtesy Bethlehem Steel Co.  
Steel sheet piling sections*

—**Pile**—A specially rolled heavy steel plate, designed so each plate in-

terlocks with those adjacent to it. A sheet pile is driven to provide a tight wall to hold lateral pressure and soft material behind it.

—**Quarry**—A quarry in which the granite lies in sheets, crossed by wide-spaced step joints.

**Sheeting**—A wall made of wood planking or metal plates to keep out water or soft materials.

**Sheet-Piling**—A diaphragm of wood, steel, or concrete, driven to form an obstruction to percolation or to prevent material from caving into an excavation.

**Shell**—The term is applied to oyster or clam shells which have been dredged from the seas and used for a road surfacing material.

—In the case of hollow tile, the outer walls.

—The body of a tank car.

—**Ground**—(See ground shell.)

—**Marble**—An ornamental marble fossil shell.

—**Marl, Ground**—(See ground shell marl.)

**Shelly**—A term used synonymously with shaly.

**Shield, Chapman**—(See Chapman shield.)

**Shim**—A small piece of wood or metal placed between two members of a structure to bring them to a desired relative elevation.

**Shimming Plate**—A plate used as a shim for increasing the elevation of a bearing.

**Shingle**—A roofing slate.

**Shingle**—Gravel and cobblestone deposited by water to resemble lapped roofing pieces. The origin is "shingl"—a Norwegian term for small round stone.

**Shipboard Plane**—A landplane designed to rise from and alight on the deck of a ship.

**Shoe**—A metal protection for the foot or end of a pile.

—That portion of a superstructure resting directly upon the abutment.

**Shop Repairs**—The repairs that a machine receives in a shop, as distinguished from repairs received in the field.

**Shoring**—Braces used temporarily to support any structure while excavating near it.

—(or shores)—Pieces of timber supporting trench or excavation sheeting temporarily.

**Short Circuit**—In electricity, a shunt circuit introduced between the source of energy and the point of useful application.

**Short Ton**—A ton of 2,000 pounds.

**Shot**—An explosion in a quarry to prepare rock for crushing.

—An explosion in a slip to break the slipping plane.

—Spherical steel or lead pellets about .5 mm. to 3 mm. in diameter.

—(in surveying) A sight.

—**Drill**—(See adamantite drill.)

**Shotcrete**—A material consisting of Portland cement, sand, and water, projected pneumatically.

**Shoulder**—In railway use, that portion of the ballast between the end of the tie and the toe of the ballast slope.

—In highway use, that portion of the roadbed between the traveled way or pavement and the top of the ditch slope in cuts or top of embankment in fills.

—**Roadbed**—In railway use, that portion of the subgrade lying between the ballast covered portion and the ditch in cuts and the top of slope on embankments.

**Shovel Run Slag**—Slag broken only by the action of the power shovel in excavating from the pit or bank, being uncrushed, unscreened and ungraded.

**Shrinkage**—The diminution in dimensions and mass of a material.

—**Allowance**—In railway use, the excess length to which a hot rail is cut when leaving the rolls to allow for shrinkage to required length when cold.

—**Limit**—In soil technology, the

moisture content, expressed as a percentage of the dry weight, required to fill the pores of a soil sample which has been dried to constant weight from a moisture content sufficient in amount to fill the soil pores completely.

—**Lineal**—(See lineal shrinkage.)

—**Ratio**—In soil technology, the shrinkage ratio is defined as the volume change expressed as a percentage of the volume of the dry soil cake, divided by the moisture loss above the shrinkage limit, expressed as a percentage of the weight of the dry cake.

**Shrink-mixing**—In the ready-mixed concrete industry, the process of completing, in a truck mixer while in transit to destination, the mixing of concrete which has been partially mixed in a stationary mixer the minimum amount of time required to incorporate the ingredients into a mass. Note—About 30 seconds.

**Shroud Line**—The suspension cords of a parachute which attach the harness to the canopy.

**Shrub**—Used in roadside development to denote a woody-stemmed perennial plant distinguished from a tree chiefly by its low stature and by having several or many primary stems arising at or near the ground.

**Shunt**—In electricity, the establishing of an additional path for the passage of an electric current.

—**Circuit**—In electricity, a circuit provided to divert a part of the current from the main circuit.

**Shut**—A seam or opening in metal formed during manufacture.

**Side Car**—A car suspended off the center line of an airship; also called "wing car."

—**Direction** (stress analysis)—(aeronautic) The direction perpendicular to the plane of symmetry.

—**Dump Car**—A car so constructed that its contents may be discharged to either side or to both

- Sides**—of the track, through doors in the car sides, by means of an inclined floor and side doors, or by tipping the car body sidewise.
- Shot**—(stadia) Readings or measurements taken to locate a point not on the traverse itself.
- Force or Component** (stress analysis)—(aeronautic) A force, or component, perpendicular to the plane of symmetry.
- Slopes**—In engineering, the inclined surfaces of the sides of a canal, dam, or embankment. Custom has sanctioned the naming of the horizontal distance first as 1.5 to 1, or frequently  $1\frac{1}{2}$  to 1, meaning a horizontal distance of 1.5 feet to 1 foot vertical.
- Support**—Resistance to horizontal movement.
- Side-Channel Spillway**—(See lateral-flow spillway.)
- Siderite**—Spathic iron ore; iron carbonate;  $\text{FeCO}_3$ .
- Sideslipping**—Motion of an aircraft relative to the air, in which the lateral axis is inclined and the airplane has a velocity component along the lateral axis. When it occurs in connection with a turn, it is the opposite of skidding.
- Sidewalk**—That portion of a street between the curb lines, or the lateral lines of a roadway, and the adjacent property lines intended for the use of pedestrians.
- Siemen's-Martin Process**—The acid open-hearth process of making steel.
- Sieve**—In laboratory work, an apparatus in which the apertures are square for separating sizes of material.
- Sight Distance**—In highway engineering, a length of unobstructed view along the road surface.
- Signal Flare**—A pyrotechnic signaling device of distinctive color and characteristics.
- Silica**—A dioxide of silicon ( $\text{SiO}_2$ ).
- Silicification**—The entire or partial replacement of rocks and fossils with silica, either as quartz, chalcedony or opal.
- Sill**—Timber laid flat on the ground to support a structure.
- (architectural) Timber or lumber laid flat on a foundation, and usually fastened thereto, on which studding rests.
- Clap**—(See clap sill.)
- Sills**—In geology, are relatively thin tabular sheets of magma which have penetrated along approximately horizontal bedding planes.
- Silt**—Consists of the finer particles of rock substance and ranges in size from 0.05 to 0.005 mm.
- Loam**—A silt loam is a soil having a moderate amount of the fine grades of sand and only a small amount of clay, over half of the particles being of the size called "silt." When dry it may appear quite cloddy, but the lumps can be readily broken, and when pulverized it feels soft and floury. When wet the soil readily runs together and puddles. Either dry or moist, it will form casts that can be freely handled without breaking. If squeezed between thumb and finger, it will not "ribbon," but will give a broken appearance.
- Silting**—When the suspended matter, or silt, in a stream is in excess of the sedimentary transporting power of the current the suspended excess is dropped.
- Silurian**—The third in order of age of the geologic periods comprised in the Paleozoic era.
- Simple Steam Engine**—A steam engine having (single) a high pressure steam cylinder or (duplex) a pair of high pressure steam cylinders.
- Simple Tone**—(See pure tone.)
- Single Acting Compressor**—A machine which consists of one or more compressing units, the compression taking place on but one stroke per revolution in each compressing element.
- Cancellation**—The arrangement of the web members of a truss hav-

- ing only one complete system of diagonals.
- Phase Motor**—In electricity, a motor driven by a single alternating current.
- Pump**—A steam driven reciprocating pump having one liquid piston or its equivalent single or double acting plunger.
- Shear**—A sliding, or a tendency to slide, on one plane.
- Stage Centrifugal Pump**—A centrifugal pump having one impeller.
- Stage Compressor**—When air or gas is compressed in each cylinder from initial intake pressure to final discharge pressure on each working stroke of the piston the machines are said to be of the single stage type.
- Stage Pump**—A pump having one impeller. (Single stage pumps designed for low heads sometimes have two or more impellers working in parallel. These are commonly termed "Bi-Rotor Pumps," when equipped with two impellers.)
- Stroke or Rod Pump**—A deep well single stroke or rod pump is a reciprocating power driven pump having a single pump rod connecting the reciprocating mechanism of the power head with the cylinder plunger.
- Suction Impeller**—(See impeller, single suction.)
- Suction Pump**—A pump equipped with a single suction impeller. (See impeller.)
- Sinking Speed**—The vertical downward component of velocity that an aircraft would have while descending in still air under given conditions of equilibrium.
- Siphon**—(hydraulics) A closed conduit, a part of which rises above the hydraulic grade line. It utilizes atmospheric pressure to effect or increase the flow of water through it.
- (inverted) A conduit or culvert with a U or V shaped grade line to permit it to pass under an intersecting roadway, stream or other obstruction.
- Sister Hooks**—A pair of hooks mounted opposite hand, forming a quick detachable connection that cannot become detached while under load.
- Sixty Cycle A. C.**—In electricity, the frequency of alternating current used for light and power purposes.
- Sized Gypsum**—Crushed gypsum of prescribed size of individual particles.
- Skeleton Construction**—A framework of structural steel which sustains all the external loads or forces from the top of a building to the foundation.
- Diagram**—A diagram which shows the general peripheral outline and the main members in a truss.
- Skelp**—A strip of iron or steel prepared for making pipes and tubes.
- Skew** (or skew angle)—The acute angle formed by the intersection of the line normal to the center line of the road improvement with a line parallel to the face of the abutments or with the center line in the case of culverts.
- Skewback**—The plane between an arch and its support.
- In architecture, the first stone of an arch, the springer, having a horizontal base and a sloping top surface.\*
- Portal**—A portal on a skew span.
- Skew-Frequency Curves**—A frequency or probability curve that is unsymmetrical about the ordinate of maximum frequency.
- Skid**—Slanting timbers forming an inclined plane up or down which objects may be slid.
- Heavy wooden or metal members attached to the bottom of heavy machinery so it may be dragged along in moving.
- To drag along a surface.
- (of motor vehicles)—Movement of the contact point of tires on a road or street surface other than

- that caused by rolling.
- Fin**—(aeronautic) A longitudinal vertical surface, usually placed above the upper wing to increase the lateral stability.
- Girder**—A built-up plate-girder with the web lying in the horizontal plane riveted to the inside of the web members of a truss to protect these members in case of derailment of trains.
- Tail**—(See tail skid.)
- Wing**—(See wing skid.)
- Skidding**—(aeronautic) Sliding side-wise away from the center of curvature when turning. It is caused by banking insufficiently, and is the opposite of sideslipping.
- Skidding Line**—A wire rope used for skidding logs.
- Skid-way**—A skid or form used for skidding heavy articles.
- Skimming**—Diverting surface water by shallow overflow to avoid diverting sand, silt, or other debris carried as bottom load.
- Removing a thin layer from the mass.
- Tank** (sewage)—A chamber so arranged that floating matter rises and remains on the surface of the sewage until removed while the liquid flows out continuously under partitions, curtain walls, or scum boards.
- Skin Friction**—(aeronautic) The tangential component of the fluid force at a point on a surface.
- Treatment** (of road surfaces)—A thin preservative coat.
- A thin surface course for improving traction.
- Skip**—An open end tray for handling stone or similar material. An open end receptacle mounted on wheels which turn it up endways by engagement with suitable shaped rails.
- A rough area (part missed by planer) on a surfaced piece of wood.
- The bucket of a concrete mixer.
- The movable container that dumps the aggregate into the drum of a mixer.
- Rope**—A wire rope used for pulling or hoisting a skip.
- Sky Writing**—The act of emitting from an aircraft a trail of smoke or other visible substance, the flight of the aircraft being so directed as to cause the trail to assume the form of letters or symbols.
- Slab**—A flat, relatively thin, mass of material.
- Bending**—(See bending slab.)
- Slackline Cableway**—A long range wire rope arrangement, including powered drums, capable of digging, conveying and elevating material from a pit, river, pond, etc. The bucket is attached to a carrier which travels on an inclined track cable, and after the bucket dumps its load it returns by gravity to the digging point.



*Photo courtesy Sauerman Bros., Chicago*

*Slackline cableway removing rock debris*

- Scraper**—A cableway of loose lines utilizing a crescent-shaped bucket attached by chains to a carrier traveling on a track cable. This machine operates much the same as the slackline cableway except that the bucket being bottomless conveys its load over the ground instead of through the air.

**Slag**—Fused or partly fused compounds of silica in combination with lime or other bases, resulting

in secondary products from the reduction of metallic ores. (See Waylite and Pottisco.)



*Photo courtesy Sauerman Bros., Chicago*  
*Slackline scraper in gravel pit*

**Slag, Acid**—(See acid slag.)

—**Agricultural** — (See agricultural slag.)

—**Air-Cooled**—(See air-cooled slag.)

—**Bank**—A mass of accumulated slag created by repeated pouring of molten slag in a concentrated area.

—**Basic**—(See basic slag.)

—**Blast Furnace**—(See blast furnace slag.)

—**Brick**—A concrete brick composed of slag sand and a small amount of cement, molded in brick form for use in masonry construction.

—**Cement**—An intimate mechanical mixture of blast furnace slag (usually granulated) and hydrated lime, accomplished without the application of heat.

—**Chips**—The product of a slag crushing plant usually ranging from No. 4 to ½-in. (square openings) in size.

—**Crushed**—(See crushed slag.)

—**Crusher Run**—(See crusher run slag.)

—**Cushion**—Fine granulated slag acting as a cushion course for brick or wood block paving.

—**Dust**—Extremely fine particles of air-cooled slag.

—**Filler**—Crushed air-cooled slag, ranging approximately from 0 to 100 mesh.

**Slag, Glassy**—(See glassy slag.)

—**Granulated**—(See granulated slag.)

—**Honeycomb** — (See honeycomb slag.)

—**Inclusion**—In welding, non-metallic mineral entrapped in the weld.

—**Ladle**—A huge steel bucket mounted on a railroad truck capable of being tilted for pouring. Used for transporting molten slag from the blast furnace to the cooling pit or bank.

—**Limey**—(See limey slag.)

—**Pancake**—(See pancake slag.)

—**Paving Brick**—Cast by pouring molten slag into rectangular molds where they cool slowly and harden. Made and used principally in England for paving, dating to early part of 18th century.

—**Pellets**—Tiny globules of slag, spherical in shape, formed by a special process.

—**Pit**—Any depression, natural or artificial, in which molten slag is poured for air cooling.

—**Plant**—The building which houses crushers, screening apparatus, storage bins and elevating mechanism for moving the slag about the building. The structure in which slag as excavated from the pit is prepared for use.

—**Roofing Granules**—Crushed slag ranging from No. 4 to ½ inch in size, used as the mineral aggregate in built-up roofing, in conjunction with bituminous material.

—**Sand**—The graded product of a slag crushing plant, ranging from 0 to ¼ in. in size. (In Europe this term has a more general meaning, designating granulated slag.)

—**Screenings** — Material resulting from the screening of various larger sizes, ranging from dust to ¼ in., having no controlled gradation.

—**Shovel Run**—(See shovel run slag.)

—**Trickle Filter**—Sewage disposal bed employing sized slag particles as a filtering medium.

—**Wool**—A product with the appearance of wool made from iron, copper, or lead blast-furnace slag alone or mixed with fluxing materials. (See mineral wool.)

**Slagging**—An English term, descriptive of the act of spreading slag chips on streets or highways to form a non-skid surface.

**Slag-lime Brick**—A brick consisting primarily of slag and hydrated lime, usually hardened in steam.

**Slagmac**—This road surface consists of a two-course pavement in which slag is used as the aggregate and an especially prepared, refined coal tar is used as the bitumen, the material being laid cold after being plant-mixed.

**Slat**—(aeronautic) A movable auxiliary airfoil, attached to the leading edge of a wing, which when closed falls within the original contour of the main wing and which when opened forms a slot.

**Slate Bed**—A tank filled with slabs of slate or other similar material, laid horizontally and spaced an inch or more apart vertically, equipped so that it may be filled with sewage, allowed to stand full for a definite period of time, drained and allowed to stand empty for a time, for the purpose of oxidizing the organic matter deposited upon and adhering to the slates.

**Slates**—Are rocks, normally clayey in composition, in which pressure has produced a very perfect cleavage, so that a block of slate can be readily split into thin, smooth, tough plates.

**Slaty Cleavage**—A tendency to split into thin smooth even plates like slate.

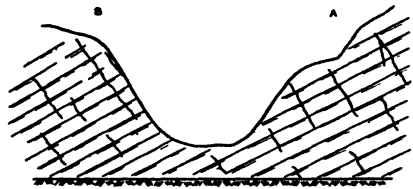
**Sleek**—The oily film of microscopic thickness present on the surface of waters about and often extending a considerable distance from sewer outlets.

**Sleeve**—A metal covering for dowel

bars to allow free movement of the same at joints.

**Slickenside**—A polished and sometimes striated surface of the walls of a vein, or on interior joints of the vein material or of rock masses.

**Slide**—The movement of a part of the earth under force of gravity.



*Conditions under which landslides are likely to happen. At "A" the bedding planes may act as a sliding surface, while at "B" the principal joints may act in the same way. (After Shand)*

**Slide-rock**—In geology, any loose fragmental rock lying on a slope.

**Sling**—A piece of wire rope for attaching loads to a hoisting apparatus.

**Slip**—Open waterway or tidal dock between piers.

—A water space protected by racks on each side and sufficient only for the accommodation of one vessel. Usually used in referring to ferries.

—(aeronautic) The difference between the geometrical pitch and the effective pitch of a propeller. Slip may be expressed as a percentage of the mean geometrical pitch, or as a linear dimension.

—In geology, a fault, a smooth joint or crack where the strata have moved upon each other.

—A grading scoop pulled by animals, which drags along the ground.

—**Or Slip Erosion**—The down-slope movement of large blocks of soil. The entire A horizon may slide over the top of the B or the A and B may slide over the C horizon.

- Function**—(aeronautic) The ratio of the speed of advance through the undisturbed air to the product of the propeller diameter and the number of revolutions per unit time; i. e.,  $V/nD$ .
- Speed** (supercharger)—(aeronautic) The supercharger speed necessary to maintain a given pressure difference between intake and discharge when there is no air delivery.
- Slipstream**—(aeronautic) The current of air driven astern by a propeller.
- Slope**—An incline or gradient as measured from the level.
- The inclined face of a cutting or embankment.
- (in land) The gradient in per cent as determined by the measurement, and computed in the following manner:
- $$\text{Slope (per cent)} = \frac{(\text{vertical dist. in ft.})}{(\text{horizontal dist. in ft.})} \times 100$$
- (sewer) That deviation, expressed in per cent, which the sewer invert makes from the horizontal, in feet.
- Gage**—A measuring instrument placed on an incline and graduated to permit reading vertical heights.
- Rounding and Transition**—In roadside development, the rounding and "streamlining" of slopes which from the center of a highway cut are transitional (that is, flattened) until the cut slopes meet the natural ground surfaces at the end of the cut.
- Side**—(See side slope.)
- Stake**—Stake set at the point where the finished side slope of an excavation or embankment cuts the surface of the ground. It is usually placed on a line at right angles to the center line and passing through the station point.
- Wall**—An inclined wall on the sloping bank of a stream, canal, embankment, or other slope and intended to preserve against scour, wash, or disintegration from other causes.
- Wash**—The process of removal of erosional debris from sloping surfaces by natural run-off of water which is not concentrated in well-defined channels.
- Sloping Bench Terrace**—A bench terrace having no fall from end to end, but a measurable slope from the back edge to the front edge of the bench.
- Slot**—(aeronautic) The nozzle-shaped passage through a wing whose primary object is to improve the flow conditions at high angles of attack. It is usually near the leading edge and formed by a main and an auxiliary airfoil, or slat (cf. slat).
- Slotted Aileron**—(aeronautic) An aileron having a nose and axis arrangement somewhat similar to a Frise aileron but having a smooth air passage between the nose portion of the aileron and the wing for the purpose of maintaining a smooth air flow over the upper surface of the aileron when its trailing edge is deflected downward.
- Eye**—An oval eye in the end of an eye-bar in place of the usual round hole.
- Sloughing**—Sliding of overlying material; same effect as caving, but usually occurs when bank or an underlying stratum is saturated.
- Slow Curing Liquid Asphaltic Material**—An asphaltic residual oil or a blend of such oil with distillates which do not volatilize readily. Usually designated as S.C.
- Slow-Operating Relay**—In electricity, a relay operating only after a specified delay.
- Sludge**—Mud or slime, as found in river bottoms, or as artificial from drill cuttings.
- The accumulated suspended solids of sewage deposited in tanks or basins, mixed with more or less

water to form a semi-liquid mass. (A.S.C.E.)

- Residue remaining in bottom of sewage digestion chambers after bacterial action has been completed, or intercepted at the surface of filters.
- The precipitate resulting from chemical treatment, coagulation or sedimentation.
- Sludge Cake**—The mass of dewatered sludge resulting from sludge pressing.
- Concentration**—The process of reducing the volume of sludge and increasing its proportion of solids by allowing it to stand in a suitable tank until the solids settle down and drawing off the relatively clean water at the top.
- Conditioning**—Treatment of liquid sludge preliminary to, and to facilitate dewatering.
- Dewatering**—The process of removing a portion of the water contained in the sludge by draining, pressing, centrifuging or by other natural or mechanical processes.
- Digestion**—The biological process by which organic matter in sludge is gasified, liquefied, mineralized or converted into stable organic matter.
- Digestion Chamber**—(1) Any chamber used for the digestion of sludge. (2) The lower story of an Imhoff tank or Travis tank.
- Digestion, Separate**—(See separate sludge digestion.)
- Drying**—The process of drying sludge by natural or artificial heat.
- Drying Bed**—A natural or artificial layer of porous material upon which sludge is dried by drainage and evaporation.
- Green**—Sludge either untreated or in which the treatment has not proceeded sufficiently to destroy its objectionable features, usually acid, pasty and odorous.
- Heavy**—Sludge as first drawn, or

in which the moisture content has not been reduced to 55 per cent.

- Pressing**—The process of dewatering by the exertion of pressure, the solids being retained by a cloth fabric which permits the water to pass through it.
- Treated**—The unodorous and humified product of proper digestion processes.
- Workable**—Sludge in which the moisture content has been reduced to the point of easy handling.

**Sluice**—A conduit for carrying water at high velocity.

—**Gates**—Devices similar in construction to the gate of a valve, so arranged that they may be built into the masonry of reservoirs and other structures.

**Sluiceway**—A culvert or controlled drainage opening generally applied to levees or dams.

**Slump**—(of P.C. concrete) A mold in the form of a frustum of a cone, 12 in. high, base diameter 8 in., top diameter 4 in., is filled with the freshly-mixed concrete in 3 layers; each layer being rodded with a  $\frac{5}{8}$ -in. bullet-pointed rod 25 times. When filled, the top is struck off and the mold lifted. The amount which the mass settles as the mold is removed is termed the "slump." A small slump indicates a stiff consistency, a large slump, a wet consistency.

**Slush Ice**—(See frazil ice.)

**Smectite**—A green clay.

**Smithsonite**—Carbonate of zinc,  $\text{ZnCO}_3$ , contains 52 per cent of zinc.

**Smokestone**—Smoky quartz.

**Smooth Pointed**—Having surface, the variations of which do not exceed 1/16 inch from the pitch line.

**Snatch Block**—A single sheave wire rope block having an easily opened side for placing the rope on the sheave.

**Snips**—Small, stout hand shears used for cutting sheet metal.

- Snow Course**—A course laid out and permanently marked on the drainage basin of a stream, along which the snow is sampled at appropriate times to determine its depth and density for the purpose of forecasting subsequent run-off.
- Crab**—A car equipped at its rear end with high, vertically-hinged side wings adaptable to being spread to cut into deep snow on each side of the track, with the vertical cutting edges of their divergent braced surfaces, in order to draw the snow in between the rails behind the car whence it may be handled with a following rotary plow, thus widening the snow cut.
- Density**—The water content of snow expressed as a percentage by volume.
- Fence**—A structure erected for the purpose of forming artificial eddies on the windward side of a cut at sufficient distance away to cause snow to deposit between the snow fence and the cut.
- Melter**—In railroading, a contrivance designed to thaw and to prevent the accumulation of snow and ice in the tracks; sometimes a torch designed to be held close to the snow or a steam, electrical, oil or gas heating device designed to be placed adjacent to or attached to the rails through the switch leads at interlockers or railroad crossings, etc.; and sometimes a chemical to be poured or strewn along the tracks.
- Melting Oil**—Any volatile oil, rich in hydrocarbon, the flame from which may be used for melting snow as it falls, especially at railroad interlocking plants. It is used in hand vessels with a narrow spout wrapped with asbestos to form a sort of torch and in stationary pots.
- Plow**—A machine for removing snow from railway tracks, highways or other traveled ways. It may be a complete unit such as a push plow on its own trucks or a rotary plow with its power plant for operating the snow wheel; or an attachment for standard equipment, such as pilot plow, a snow crab or a flanger. They are made as V-plows or side push plows, with or without wings.
- Sample**—A core cut from a snow-bank on a snow course, from which the depth and density may be determined.
- Sampler**—A set of light jointed tubes for taking snow samples and a spring scale graduated to read directly the corresponding depth of water contained in a snow sample.
- Surveys**—Surveys usually made in the spring of the year on the headwaters of streams to determine the water stored thereon in the form of snow, as a means of forecasting the subsequent spring run-off.
- Sweeper**—A car equipped with brushes, near the rails, and the necessary machinery to revolve them; used for sweeping snow from the rails.
- Snub**—To bend a rope around a post, chock, cleat, etc., so that the friction makes it possible to hold the end or let it out gradually even though there is considerable load on it.
- Soaking Pit**—A heated pit in which the ingots, after being stripped, are placed for the purpose of equalizing the temperature throughout their mass.
- Soap Rock**—A synonym for soapstone.
- Soapstone**—A metamorphic rock of massive schistose, or interlocking fibrous texture and soft unctuous feel which usually consists of the mineral talc or some closely related mineral species. Talc is a hydrous magnesium silicate theoretically composed of 63 per cent silica, 32 per cent magnesia, and 5 per cent of combined water.
- Soar**—To fly without engine power

and without loss of altitude, as does a glider in ascending air currents.

**Societies, Technical**—(See technical societies.)

**Socket, Half-Turn**—(See half-turn socket.)

**Sod**—A squared block of earth bound with contained vegetable matter.

—**Bag Dam**—In soil conservation, small temporary dams made with burlap bags filled with sod.

—**Slopes**—A term used in roadside development to refer to the sodding of slopes to stop erosion. The sod usually consisting of roots of grass, herbs, etc.

—**Strips**—A narrow band of grass or other close-rooted crop, placed across a channel to spread and retard the flow of water. A strip of sod left in a natural waterway to prevent erosion.

**Sodalite**—An isometric mineral containing sodium, aluminum, silica, and chlorine. Sometimes bluish in color.

**Soda Nitre**—Sodium nitrate,  $\text{NaNO}_3$ .

**Sodding**—The placing of grass sods on the slopes of embankments or other earth surfaces.

**Soffit**—The under or concave side of an arch.

—The underneath surface of an architectural member such as a beam, arch, lintel, or a ceiling.

**Soft Spot**—Small areas in excavation or embankment, or the sub-soil under an embankment, saturated with water and having a relatively small supporting power.

**Soil**—A mixture of fine earthy materials which is of secondary origin and is produced by the decomposition of various kinds of rocks intermingled more or less with organic matter resulting from the growth and decomposition of vegetation or animal matter.

—Opposite to acid soil; often called "sweet" soil.

—**Acid**—(chemical composition) A soil which is deficient in available

bases, particularly calcium, and which gives an acid reaction when tested by standard methods. Field tests are made by the use of litmus, of Soiltex, and of other indicators. There is no full agreement on the most satisfactory test for acidity or as to the actual character of an acid soil. The intensity or degree of acidity may be expressed by qualifying words, "strongly," "moderately," etc.

—**Alkaline**—(chemical composition) A soil containing an excessive amount of the alkaline (in true chemical sense) salts.

—**Amorphous**—(structure) A soil of fine texture having a massive or uniform arrangement of particles throughout the horizon. Structureless. Found only in soils of finest texture, where individual grains cannot be recognized.

—**Brittle**—(consistency) A soil which when dry will break with a sharp, clean fracture. If struck a sharp blow, it will shatter into cleanly broken hard fragments.

—**Calcareous**—(chemical composition) A soil containing sufficient calcium carbonate to effervesce when tested with weak ( $\text{N}/10$ ) hydrochloric acid. Depending on the amounts present, these soils may be designated as slightly calcareous, strongly calcareous, etc.

—**Cementation of**—A condition occurring when the soil grains or aggregates are caused to adhere firmly and are bound together by some material that acts as a cementing agent (as colloidal clay, iron or aluminum hydrates, lime carbonate, etc.). The degree of cementation or the persistence of the cementation when the soil is wetted should be stated. Some terms indicate the permanence, as "indurated," "hardpan," etc.

—**Cheesy**—Having a more or less elastic character, deforming considerably without rupture, yet broken without difficulty or the ap-

plication of much force. (Characteristic of certain highly colloidal soils when thoroughly wet.)

**Soil, Classification of** (by U. S. Bureau of Public Roads)—Group

A-1—Well-graded material, coarse and fine, excellent binder. Highly stable under wheel loads, irrespective of moisture conditions. Functions satisfactorily when surface treated or when used as a base for relatively thin wearing courses.

Group A-2—Coarse and fine materials, improper grading or inferior binder. Highly stable when fairly dry. Likely to soften at high water content caused either by rains or by capillary rise from saturated lower strata when an impervious cover prevents evaporation from the top layer, or to become loose and dusty in long-continued dry weather.

Group A-3—Coarse material only, no binder. Lacks stability under wheel loads, but is unaffected by moisture conditions. Not likely to heave because of frost nor to shrink or expand in appreciable amount. Furnishes excellent support for flexible pavements of moderate thickness and for relatively thin rigid pavements.

Group A-4—Silt soils without coarse material, and with no appreciable amount of sticky colloidal clay. Has a tendency to absorb water very readily in quantities sufficient to cause rapid loss of stability even when not manipulated. When dry or damp, presents a firm riding surface which rebounds but very little upon the removal of load. Likely to cause cracking in rigid pavements as a result of frost heaving, and failure in flexible pavements because of low supporting value.

Group A-5—Similar to Group A-4, but furnishes highly elastic supporting surfaces with appreciable rebound upon removal of load even when dry. Elastic properties in-

terfere with proper compaction of macadams during construction and with retention of good bond afterwards.

Group A-6—Clay soils without coarse material. In stiff or soft plastic state absorb additional water only if manipulated. May then change to liquid state and work up into the interstices of macadams or cause failure due to sliding in high fills. Furnish firm support essential in properly compacting macadams only at stiff consistency. Deformations occur slowly and removal of load causes very little rebound. Shrinkage properties combined with alternate wetting and drying under field conditions are likely to cause cracking in rigid pavements.

Group A-7—Similar to Group A-6, but at certain moisture contents deforms quickly under load and rebounds appreciably upon removal of load, as do subgrades of Group A-5. Alternate wetting and drying under field conditions leads to even more detrimental volume changes than in Group A-6 subgrades. May cause concrete pavements to crack before setting and to crack and fault afterwards. May contain lime or associated chemicals productive of flocculation in soils.

Group A-8—Very soft peat and muck incapable of supporting a road surface without being previously compacted.

—**Clay**—A clay is a fine-textured soil that forms very hard lumps or clods when dry. When the moist soil is pinched out between the thumb and fingers it will form a long, flexible ribbon.

—**Clay Pan**—(structure) An horizon of accumulation or a stratum of stiff, compact, and relatively impervious clay. The clay pan is not cemented, and if immersed in water can be worked to a soft mass. Its presence may interfere

with water movement or root development the same as a true hardpan. It is more difficult to overcome, for, whereas a hardpan can be shattered by explosives, the clay pan, after breaking by any means, will run together and re-form as soon as thoroughly wetted. The distinction between hardpan and clay pan is an important one in the soil classification.

**Soil, Clod or Cloddy**—(structure)

Aggregates of irregular, angular shape, usually 4 centimeters or more in diameter and of a hard consistency.

—**Coarse Cloddy**—(structure) When most of the clods are 10 centimeters or more in diameter.

—**Coarse Crumb**—(structure) Crumbs 2 centimeters or more in diameter.

—**Coarse Granular**—(structure) Aggregates close to maximum size.

—**Coarse Nut** (structure)—Aggregates over 3 centimeters in diameter.

—**Columnar** (structure)—A natural arrangement of the soil mass in more or less regular columns separated by vertical cleavage lines, and usually broken by horizontal cracks into sections with longer vertical than horizontal axes, the tops of the columns being rounded.

—**Compact**—The soil packed together in a dense, firm mass, but without any cementation. Noticeably resistant to forces tending to cause rupture or deformation. Cohesive. Hard. Relative degree of compactness may be expressed by terms as slightly compact, very compact, etc.

—**Consistency**—A term expressing the degree of cohesion of the soil particles and the resistance offered to forces tending to deform or rupture the aggregates. Consistency and structure are closely related and frequently interdependent. The terms expressing consistency and structure are dis-

tinct, however, and need not be confused or used with double meaning. A study of published reports shows a general use of terms expressing both the consistency and the structure in nearly all soil descriptions.

—**Crumb**—(structure) Porous aggregates of irregular shape, rarely over 2 centimeters in diameter and of a medium to soft consistency.

—**Crust or Crusted**—(structure) This term is used where the upper or surface horizon coheres into plate or crust distinct from the horizon immediately below it.

—**Crust-mulch**—(structure) An arrangement where a surface crust is underlain by a horizon of loose, incoherent particles of mealy, crumb, or granular structure.

—**Dense**—(structure) Having a minimum of pore space and an absence of any large pores or cracks. Approaching amorphous.

—**Evaporation**—Evaporation of water from moist soils.

—**Fine Cloddy**—(structure) When most of the clods are close to the minimum size.

—**Fine Crumb**—(structure) Crumbs 5 millimeters or less in diameter.

—**Fine Granular**—(structure) Aggregates under 5 millimeters diameter.

—**Fine Nut**—(structure) Aggregates below 1 centimeter in diameter.

—**Fines**—In soil technology, this refers to that fraction passing a 40-mesh sieve and is the portion used for determining the physical characteristics of the soil.

—**Firm**—(consistency) Resistant to forces tending to produce rupture or deformation. Moderately hard. Aggregates can be broken between fingers.

—**Firmly Cemented**—Cementing material of considerable strength requiring considerable force to rupture the mass. Usually breaks, with clean though irregular fractures, into hard fragments.

—**Floury**—(texture) Fine-textured

soil consisting predominantly of silt (or flocculated clay with aggregates of silt size) which when dry is incoherent, smooth, and dust-like.

**Soil, Fluffy**—(structure) A surface condition where the aggregates are loose, of light weight and fine texture, with no cohesion or evidence of arrangement; floury.

—**Friable**—(consistency) Aggregates readily ruptured and crushed with application of moderate force. Easily pulverized or reduced to crumb or granular structure.

—**Grading**—(See soil, subgrade, uniform and soil, subgrade, non-uniform.)

—**Granular**—(structure) Aggregates varying in size to 2 centimeters in diameter, of medium consistency, and more or less subangular or rounded in shape.

—**Gravelly or Stony**—All of the classes of soils, if mixed with a considerable amount of gravel or stone, may be classed as gravelly sandy loams, gravelly clays, etc., or as stony clays, etc.

—**Gritty**—(texture) Containing a sufficient amount of angular grains of coarse sand or fine gravel, so that these dominate the "feel." Usually applied to medium-textured soils (loams) where the actual quantity of these coarse grains is rather small.

—**Hard**—(consistency) Resistant to forces tending to cause rupture or deformation. Difficult or impossible to crush aggregates with fingers only.

—**Hardpan**—(structure) An horizon of accumulation that has been thoroughly cemented to an indurated, rock-like layer that will not soften when wet. The term hardpan is not properly applied to hard clay layers that are not cemented, nor to those layers that may seem indurated when dry but which soften and lose their rock-like character when soaked in water. The true

hardpan is cemented by materials that are not readily soluble, and is a hard layer that definitely and permanently (in nature) limits downward movement of roots and water.

—**Heavy**—(texture) Applied to soils of fine texture in which clay predominates, with dense structure and firm to compact consistency. The term is also applied to soils containing a somewhat higher proportion of the finer separates than is typical of that textural class (as a "heavy sandy loam").

—**Honeycomb**—(structure) A natural arrangement of the soil mass in more or less regular five or six sided sections separated by narrow or hairline cracks. Usually found as a surface structure or arrangement.

—**Indurated**—Cemented into a very hard mass which will not soften or lose its firmness when wet, and which requires much force to cause breakage. Rock-like.

—**Laminated**—(structure) An arrangement of the soil mass in very thin plates or layers, less than 1 millimeter in thickness, lying horizontal or parallel to the soil surface. Usually medium to soft consistency.

—**Leaf Mold**—(chemical composition) The accumulation on the soil surface of more or less decomposed organic remains, usually the leaves of trees and remains of herbaceous plants. The A horizon.

—**Light**—(texture) Applied to soils of coarse to medium texture with very low silt and clay content, incoherent, single-grained structure, and loose consistency. The term is also applied to soils containing somewhat higher proportions of the coarser separates than is typical of that textural class (as a "light loam").

—**Loose**—Soil particles or small aggregates are independent of each other or cohere very weakly with

a maximum of pore space and a minimum resistance to forces tending to cause rupture.

- Soil, Marbled**—(color) The presence of two or more distinct colors in approximately equal amounts not blended but more or less mixed in occurrence in the soil mass. In a marbled soil there is no general or predominant color, as in the case of a mottled soil.
- Massive**—(structure) A soil mass showing no evidence of any distinct arrangement of the soil particles. Structureless. May be found in soils of any structure.
- Mealy**—(structure) A crumb-like structure in which the aggregates are soft to very soft consistency and usually less than 5 millimeters in diameter.
- Mellow**—(consistency) Soil particles or aggregates are weakly adhered in a rather porous mass, readily yielding to forces causing rupture. A consistency softer than friable. Without tendency to pack.
- Moisture**—The quantity of water held within soil available for crop production.
- Mortar**—In soil technology, this refers to that fraction passing a 10-mesh sieve and consists of coarse and fine sand, silt and clay.
- Mottled**—(color) The presence of spots, streaks, or splotches of one or more colors in a soil mass of another predominant color. In mottled soils the colors are not mixed and blended, but each is more or less distinct in the general ground color. In color descriptions the ground color and the color of the included spots should be designated. Mottling is usually but not necessarily associated with poor drainage. The use of the term should not be confined to poorly drained soils but should be applied wherever the term fits.
- Muck**—Composed of thoroughly decomposed black organic mate-

rial, with a considerable amount of mineral soil material, finely divided and with a few fibrous remains.

- Nut**—(structure) Compact aggregates, more or less rounded in shape, of hard to medium consistency, and from one-half to 4 centimeters in diameter.
- Peat**—Composed predominantly of organic material, highly fibrous, with easily recognized plant remains.
- Plastic**—(consistency) Readily deformed without rupture. Pliable but cohesive. Can be readily molded. Puttylike. This term applies to those soils in which at certain stages of moisture the grains will readily slip over each other without the mass cracking or breaking apart.
- Plate or Platy**—(structure) An arrangement of the soil mass in plates or layers 1 to 5 millimeters or more in thickness, lying horizontally or parallel to the soil surface. Usually medium to hard consistency.
- Preservative**—(See preservative.)
- Prismatic Columnar**—(structure) Term used when the sections are very regular in size, straight-sided, with the vertical axes much longer than the horizontal axes and the tops of the columns flat.
- Profile**—A plotted log of soil depths like a well profile, which depths are determined by examining the soil units natural field condition. This work is best accomplished by examining excavations, road cuts, etc., but the method of using a soil auger is the most common. There is no definite rule to follow in making these examinations, except that the soil should be examined at intervals close enough to determine the soil type.
- Saline**—(chemical composition) A soil containing excessive amounts of the neutral or non-alkaline salts.

**Soil, Sedentary**—May be defined as one which has resulted from chemical decomposition or disintegration, from any or all of the processes involved in rock-weathering or from organic accumulation and is found today occupying its original site.

—**Sharp**—(texture) Containing angular particles in sufficient amount to dominate the "feel." Abrasive.

—**Single-grained**—(structure) An incoherent condition of the soil mass with no arrangement of the individual particles into aggregates. Structureless. Usually found in soils of coarse texture.

—**Smooth**—(texture) Containing well-rounded coarser particles and a predominance of the finer separates. Not abrasive.

—**Soft**—(consistency) Yielding readily to any force causing rupture or deformation. Aggregates readily crushed between fingers.

—**Softly Cemented**—Term applied when cementing material is not strong nor evenly diffused throughout the mass. Aggregates are readily crushed, but do not break with a clean fracture.

—**Specific Gravity**—In soil technology, the weight of the oven-dried soil divided by the true volume of the soil particles.

—**Spotted, Speckled, Streaked, Variegated**—(color) Such terms can be used when their generally accepted meaning describes the color distributions that occur in the soils.

—**Sticky**—(consistency) Applied to soils showing a decided tendency when wet to adhere to other materials and foreign objects.

—**Stiff**—Resistant to rupture or deformation. A soil stratum or horizon that is firm and tenacious, and tending toward imperviousness. Usually applied to condition of the soil in place and when moderately wet.

—**Structure**—The arrangement of the

individual grains and aggregates that make up the soil mass. The structure may refer to the natural arrangement of the soil when in place and undisturbed (as structural profile) or to the soil at any degree of disturbance. The terms used indicate the character of the arrangement, the general shape and the size of the aggregates, and in some cases may indicate the consistency of those aggregates.

—**Structureless**—(structure) Without any discernible structure or arrangement of the soil particles into aggregates. This condition is better expressed by the terms single-grained, massive, amorphous, etc.

—**Subgrade, Non-uniform**—Group B-1—Non-uniform natural ground due to abrupt variation in soil characteristics or soil profile, or to frequent change in field conditions. Group B-2—Non-uniform subgrade due to non-uniform composition of fill.

Group B-3—Non-uniform subgrade consisting in part of natural ground and in part of fill materials.

—**Substructure**—Man-made fills and embankments of disturbed soil placed on the natural soil foundation (regardless of whether or not the fills are of selected soils).

—**Tenacious**—(consistency) Soils showing a decided resistance to rupture. Soil mass adheres firmly. The terms "sticky" and "tenacious" are often used as synonyms, but in soil usage the former is taken to refer to adhesion, the latter to cohesion. Both terms may be applicable to a soil at the same time.

—**Texture**—Indicating the size of the individual soil grains or particles and the proportions of material of each size present in any given case. As the soil is usually made up of particles of widely varying size, the textural terms express the average effect or the combined effect of all these grain sizes. They may indicate the predominance (in

(quantity or in textural effect) of a certain group of grains. Texture is determined by mechanical analysis, a laboratory process of separating the soil into groups of grain sizes. The system of mechanical analysis used by the Bureau of Chemistry and Soils separates the soil material into seven grain sizes or "separates" having the following sizes and names:

2 to 1 millimeter, fine gravel.

1 to 0.5 millimeter, coarse sand.

0.5 to 0.25 millimeter, sand.

0.25 to 0.10 millimeter, fine sand.

0.10 to 0.05 millimeter, very fine sand.

0.05 to 0.005 millimeter, silt.

Below 0.005 millimeter, clay.

In the following paragraphs are given the proportions of certain of the grain sizes found in the major soil textures:

Sands contain less than 20 per cent of silt and clay. (Include coarse, fine and very fine sands.)

Sandy loams contain from 20 per cent to 50 per cent of silt and clay, but do not have over 15 per cent of clay. (Include coarse, fine, and very fine sandy loams.)

Loams have more than 50 per cent of silt and clay combined but have less than 50 per cent of silt and less than 20 per cent of clay.

Silt loams have more than 50 per cent of silt and less than 20 per cent of clay.

Clay loams have more than 50 per cent of silt and clay combined but less than 50 per cent of silt and between 20 per cent and 30 per cent of clay. (Include sandy clay loams, clay loams, and silty clay loams.)

Clays have more than 50 per cent of silt and clay combined and more than 30 per cent of clay. (Include sandy clays and silty clays.) In the field texture is determined by the feel of the soil mass when rubbed between the fingers.

—**Tight**—A stratum or horizon that

is compact, impervious and tenacious, and usually plastic.

**Soil, Tough**—Resistant to rupture. Tenacious. A stratum or horizon that can be readily bored into with the auger but which requires much force in breaking loose and pulling out the core of soil.

—**Transported**—This may be defined as soil which has been removed by water, ice or wind from the place in which it was first deposited, carried a greater or less distance and then deposited.

—**Types**—(See soil, subgrade, uniform, and soil, subgrade, non-uniform.)

—**Weakly Cemented**—Term applied when cementing material is not strong, and the aggregates can be readily broken into fragments with a more or less clean fracture.

—**Vesicular**—(structure) A soil horizon or soil aggregate containing many small rounded cavities smooth on the inside as though formed by gas bubbles.

**Solar Compass**—A surveyor's compass having a solar attachment.

—**Component, Principal**—(See principal solar component.)

**Soldering**—In welding, the coating in the molten state of an alloy of lead and tin on the surface of metals of a higher melting point. This process is used to coat the surface of metals or to join separate base metal parts.

**Solenhofen Stone**—A limestone found at Solenhofen, Bavaria, valued for lithographic purposes.

**Sole Plate**—A plate riveted to the bottom of a beam or girder to bear on the masonry plate.

**Solid Solution**—In cement technology, a form of chemical combination in which a chemical compound dissolves certain other constituents. Such solutions may modify somewhat the properties of the compound.

—**Steel Floor**—A floor composed of steel beams and steel plates, such

- as flat, buckled, or trough plates.
- Web**—A web composed of one or more solid plates.
- Solidity**—(aeronautic) The ratio of the total blade area of a rotor to the area of the disk swept by the blades.
- Soluble Solids** (sewage)—Solids present in solution.
- Solum**—The weathered portion of the soil mass including the full depth to which eluviation and illuviation are in evidence; the A and B horizons.
- Solution**—A liquid combination of liquid and non-liquid substance or of two or more liquids, as a salt and water or coal-tar and creosote.
- Gravity**—(See gravity solution.)
- Molar**—(See molar solution.)
- Normal**—(See normal solution.)
- Openings**—In ground water technology, these openings are produced chiefly by the water that penetrates pre-existing interstices. They are of two kinds—those due to the chemical decomposition of rocks and the solution and subsequent removal of the soluble products, and those due to the solution and removal of soluble rocks.
- Solvent**—A substance (usually liquid) capable of, or used in, dissolving something.
- Sound**—An alteration in pressure, particle displacement or particle velocity propagated in an elastic material or the superposition of such propagated alterations.
- Articulation**—In acoustics, the sound articulation is the percentage of the total number of spoken fundamental sounds which are correctly recognized when the sounds are spoken in meaningless syllables.
- Diffuse**—(See diffuse sound.)
- Energy Density**—In acoustics, sound energy density is the sound energy per unit volume. The unit is the erg per cubic centimeter.
- Energy Flux**—In acoustics, the average over one period of the rate of flow of sound energy through any specified area. The unit is the erg per second.
- Infra Audible**—(See infra audible sound.)
- Pressure, Effective**—(See effective sound pressure.)
- Pressure, Instantaneous**—(See instantaneous sound pressure.)
- Pressure, Maximum**—(See maximum sound pressure.)
- Pressure, Peak**—(See peak sound pressure.)
- Ultra Audible**—(See ultra audible sound.)
- Unpitched**—(See unpitched sound.)
- Wood**—Wood free from any form of decay, incipient or advanced.
- Sounding Balloon**—A small balloon used to send up a meteorograph.
- Space, Fault**—(See fault space.)
- Spacer**—An iron casting usually spool-shaped with a hole through its axis, used to separate beams or girders when two or more of them are used to form a member.
- Spacing**—In highway lighting, spacing is the distance in feet between two successive lighting units measured along the center line of a roadway.
- In quarrying, the distance between drill holes in a row.
- Table**—A movable table with a gauge on one side, used in shops for multiple punching work.
- Spaded Finish**—Having surface formed by spading coarse aggregate back from the form into the mass concrete, so as to bring a surface of mortar next to the form.
- Spall**—In masonry, to reduce irregular blocks of stone approximately to size by chipping with the hammer.
- Fragment broken off by a blow, irregular in shape, and of sufficient size to be comparable to the parent mass.
- Span**—The horizontal distance between supports. The distance be-

tween the sidewalls of culverts. The distance between supports of bridge trusses or the clear distance over which an arch reaches. Used alternately, at times, in place of the word "bridge."

- The unsupported length of a member or a structure.
- (aeronautic) The maximum distance, measured parallel to the lateral axis, from tip to tip of an airfoil, of an airplane wing inclusive of ailerons, or of a stabilizer inclusive of elevator.
- Span, Bascule**—The moving span of a bascule bridge.
- Beam**—A span built with beams.
- Cantilever**—(See cantilever span.)
- Channel**—The span which bridges the deepest part of a river or that part most accessible for navigation.
- Clear**—The distances between the two inside faces of the supports of a span.
- Draw**—(See draw span.)
- Effective**—The distance from center to center of end pins in a bridge span, or that between centers of bearings in any structure.
- Fixed**—(See fixed span.)
- Girder**—(See girder span.)
- Length**—The distance from center to center of supports.
- Lift**—A span of a bridge that is raised for the passage of vessels.
- Loading**—The ratio of the weight of an airplane to its equivalent monoplane span.
- Movable**—(See movable span.)
- Shore**—Either the first or the last span of a bridge.
- Skew**—A span making an angle, other than a right angle, with the axes of the piers and abutments.
- Spread**—(See spread span.)
- Suspended**—A span connecting two cantilever arms and supported wholly thereby.
- Swing**—(See swing span.)
- Through**—A span in which the traffic is carried between the

trusses and which has lateral bracing in the plane of the upper chords.

**Spandrel**—The space from abutment to abutment in an arch bridge extending from the top of the arch masonry to the top of the roadway.

—As used architecturally, the triangular area enclosed between the curve of an arch and lines drawn horizontally through the apex and vertically from its spring.\*

—**Fill**—The fill between the arch ring of an arch bridge and the pavement.

—**Wall**—The wall above the extrados of an arch and below the coping or the string course.

**Spar, Wing**—(See wing spar.)

**Spark Coil**—In electricity, an induction coil. Used in connection with ignition systems of internal combustion motors.

—**Gap**—The air space or gap through which a disruptive electric discharge passes. A gap forming part of a circuit between two opposing conductors and filled with air or other dielectric, across which a spark passes when a certain difference of potential has been reached.

**Specification**—That part of the contract describing the materials for or the details of construction.

**Specific Gravity**—(chemists' and physicists' standard) The ratio of the mass of a body at 0° C. to the mass of an equal volume of water at 4° C.

—(of solids and liquids) The ratio of the weight in air of a given volume of the material at a stated temperature to the weight in air of an equal volume of distilled water at a stated temperature.

—**Gravity, Absolute**—(of solids and liquids) The ratio of the weight referred to vacuum of a given volume of the material at a stated temperature to the weight referred to vacuum of an equal volume of

gas-free distilled water at a stated temperature.

**Specific Gravity, Apparent**—(of solids) The ratio of the weight in air of a given volume of the impermeable portion of a permeable material (that is, the solid matter including its impermeable pores or voids) at a stated temperature to the weight in air of an equal volume of distilled water at a stated temperature.

—**Bulk**—(of solids) The ratio of the weight in air of a given volume of a permeable material (including both permeable and impermeable voids normal to the material) at a stated temperature to the weight in air of an equal volume of distilled water at a stated temperature.

—**Energy**—In hydrology, the energy of a stream referred to its bed, namely, depth plus velocity head of mean velocity.

—**Retention**—In ground water technology, the water-retaining capacity of a rock or soil when expressed in percentages of the total volume of rock or soil.

—**Yield**—In ground water technology, the water-yielding capacity of a rock or soil when expressed in percentages of the total volume of rock or soil.

**Spectroscope**—An instrument used to produce a spectrum of the light from any source by the passage of the rays through a prism or their reflection from a grating, and for the study of the spectrum so formed.

**Spectrum, Gas**—(See gas spectrum.)

**Speech Power, Phonetic**—(See phonetic speech power.)

**Speed**—Time rate of motion measured by the distance moved over in unit time. Unit, one centimeter per second.

**Spelter**—Zinc or galvanized coating.

**Sperrylite**—A platinum arsenide,  $\text{PtAs}_2$ , containing about 44 per cent arsenic, and 56 per cent of

platinum. Chief ore of platinum.

**Spherical Excess**—The amount by which the sum of the three spherical angles of a spherical triangle exceeds 180 degrees.

**Spheroidal**—A descriptive term applied to igneous rocks that break up on cooling into spheroidal masses analogous to basaltic columns.

**Spheroidizing**—Prolonged heating of iron-base alloys at a temperature in the neighborhood of, but generally slightly below, the critical temperature range, usually followed by relatively slow cooling.

**Spherulites**—In some glassy rocks are found spherical bodies ranging in size from pellets to large spheres ten feet in diameter. These bodies are named spherulites when the constituents are placed radially around one common center.

**Spiegeleisen**—Pig iron that contains from ten to thirty per cent of manganese.

**Spillway**—A low-level passage serving a dam or reservoir through which surplus water may be discharged; usually an open ditch around the end of the dam, a gateway or a pipe in a dam opened by lifting a gate or opening a door or valve by means of machinery, sometimes automatic, lowering the stage of water and thus reducing the pressure behind the dam and preventing the water from overtopping it.

—An outlet pipe, flume or channel serving to discharge water from a ditch, ditch-check, gutter or embankment protector.

**Spigot**—The end of a pipe, fitting, or valve, that is inserted into the bell end.

**Spin**—A maneuver in which an airplane descends along a helical path of large pitch and small radius while flying at a mean angle of attack greater than the angle of attack at maximum lift (cf. spiral).

**Spinel**—A magnesium aluminate,

$MgAl_2O_4$ , containing 72 per cent alumina and 28 per cent magnesia. Sometimes the magnesium may be replaced by iron or manganese.

**Spinner**—(aeronautic) A fairing of approximately conical or paraboloidal shape, which is fitted coaxially with the propeller hub and revolves with the propeller.

**Spiral**—When used with respect to track, a form of easement curve in which the change of degree of curve is uniform throughout its length.

—The transition curve (or spiral) is an easement curve providing a gradual change of curvature from a straight line to a simple curve. The degree of change of curvature is uniform throughout its length.

—A maneuver in which an airplane descends in a helix of small pitch and large radius, the angle of attack being within the normal range of flight angles (cf. spin).

—**Curve**—(railroad or highway surveying) A curve of progressively decreasing (or increasing) radius used in joining a tangent with a simple circular curve or in joining two circular curves of different radii. (Also called Transition Curve.)

—**Flow Tank**—A tank used in carrying out the activated sludge process in which a spiral motion is given to the sewage in its flow through the tank by the introduction of air through a line of diffusers placed on one side of the bottom.

—**Ten Chord**—An approximate spiral measured in ten equal chords and whose change of degree of curve is directly proportional to the length measured along the spiral by such chords.

—**Winding**—In electricity, that system of winding used on a ring armature.

**Spit**—A small point of land extending into a body of water, or a long, narrow shoal extending from the shore.

**Splice**—The method of joining two pieces of rope without increasing its diameter or weakening it.

—Method of joining two pieces of wood by butting ends and nailing piece on top or of rail steel by bolting piece over steel over butt jointed ends of rails.

—To unite two pieces firmly together.

—**Chord**—(See chord splice.)

—**Drilling**—The spacing of holes in the ends of rails or other track structures to receive the bolts for the fastening of joint bars.

—**Lap**—(See lap splice.)

—**Plate**—A flat sheet of steel riveted or welded to two butt jointed steel members. (See fish plate.)

**Split Flap**—(aeronautic) A hinged plate forming the rear upper or lower portion of an airfoil. The lower portion may be deflected downward to give increased lift and drag; the upper portion may be raised over a portion of the wing for the purpose of lateral control (cf. upper-surface aileron).

**Split or Seam Face**—In stone masonry work, this refers to the dressing in which the surface shall present a smooth appearance free from tool marks, with surface variations not exceeding 1 inch inside or outside the pitch line.

—**S**—(aeronautic) A maneuver consisting of a half snap roll followed by a pull-out to normal flight, thus obtaining a 180 deg. change in direction accompanied by a loss of altitude.

—**Web**—A longitudinal crack visible along the side of the web of a railroad rail and extending into or through it.

**Spodumene**—A monoclinic pyroxene having the formula  $Li_2O \cdot Al_2O_3 \cdot 4SiO_2$ , containing 65 per cent silica, 27 per cent alumina, and 8 per cent lithia.

**Spoil**—Material in excess of requirements for an embankment.

—**Banks**—Banks away from the con-

struction formed by waste excavation.

**Spoiler**—(aeronautic) A small plate arranged to project above the upper surface of a wing to disturb the smooth air flow, with consequent loss of lift and increase of drag (cf. interceptor).

**Sponge**—Metal in a porous form.

**Sponson**—A protuberance from a seaplane hull designed to increase the beam or give lateral stability at rest.

**Spores**—The reproductive bodies of fungi or bacteria corresponding to the seeds of higher orders of plants.

**Spot Board**—In railway use, a sighting board placed above and across the track at the proposed height to indicate the new surface and insure its uniformity.

—**Patch**—Local surface treatment of bare or low spots.

—**Sod Method**—Used in roadside development to denote a method of sodding in which small pieces or "chunks" of sod are used, spaced at regular intervals.

**Spray**—To distribute (a liquid) over a surface under pressure.

—**Strip**—A strip projecting from the hull of a seaplane to change the manner in which the spray is thrown.

—**Treatment**—In wood preservation, the application of one or more coats of a liquid preservative to the surface of timber with a spraying device.

**Spread Footing**—The widened portion below steel cylinders for piers; the spreading being done after the cylinders are sunk to place.

—A wide footing under a supporting column, pier, or abutment.

—**Span**—A span at the end of a bridge widened out at one or both ends.

**Spreader**—In soil conservation, a wood, timber, concrete, or masonry plate or wall set in a channel or ditch with its upper edge

level for the purpose of spreading the flow evenly over the channel floor.

—A device or machine for casting or uniformly depositing fine and coarse aggregates on a road or other traveled way.

**Spring**—A natural outflow of water from the ground at a single point, and from a definite opening.

—**Line**—Intersection of those diameters of the sewer lying in horizontal plane with internal circumference of sewer.

—**Range**—The range of tides at the time of spring tides.

—**Tides**—The tides occurring at the times of new moon and full moon.

**Springing Line**—The line of intersection between the intrados and the supports of the arch.

**Springwood**—The inner, usually softer and more porous portion of each annual ring.

**Sprinkler Nozzle**—A nozzle used for applying sewage in the form of a spray to trickling filters.

—An orifice of designed size and shape for permitting passage of liquids under pressure into the atmosphere.

**Sprinkling Filter**—A trickling filter in which sewage is applied by spray.

**Spud**—A device used for anchoring a dredge or other floating craft to the bottom or bank of a body of water. The usual form consists of a vertical timber sliding in guides attached outside the scow side, or in a well formed within the hull.

—**Aerial**—A cable attached to a spud, deck high, for moving and anchoring a dredge.

—**Rope**—A wire rope used for raising and lowering the spuds on a dredge boat.

**Spur**—A line of railway diverging from a main or branch line, and over which no regular train service is maintained.

—**Dike**—A dike extending out from

shore to (1) deflect river current, or (2) induce silting and formation of sand bars.

—**Terrace**—Short terrace used to collect or divert run-off.

**Squared-stone Masonry**—Masonry in which the stones are roughly squared and roughly dressed on beds and sides.

**Squat**—A downward, or negative, displacement of the center of gravity of a seaplane while running on the water.

**Squeegee**—A tool with a rubber or leather edge for scraping or cleaning hard surfaces, or for spreading and distributing liquid material over and into the superficial interstices of roadways.

—**Coat**—An application of a liquid to a surface by means of a squeegee.

**Stability**—In sewage technology, the capability of sewage or effluent to resist putrefaction under conditions to which it is subjected.

—In soil technology, this is defined as resistance to later flow when loaded and in road stabilization, depends on the combined effect of internal friction supplied by the granular material, and cohesion supplied by the binder soil.

—The ability to resist change of position.

—(aeronautic) That property of a body which causes it, when its equilibrium is disturbed, to develop forces or moments tending to restore the original condition.

—**Relative**—(See relative stability.)

**Stabilization** (after C. A. Hogentogler, U. S. Bureau of Public Roads)

—(soil or road) The process of giving natural soils enough abrasive resistance and shear strength to accommodate traffic or loads under prevalent weather conditions, without detrimental deformation. The methods employed include the use of admixtures, compaction and densification by specific technical theory and laboratory control. Optimum water content is fundamen-

tal with gradation. Admixtures may be soil materials, deliquescent chemicals, solutions of electrolytes, soluble cementitious chemicals, primes and neutralizers, and insoluble binders.

—(road) A soil stabilized road consists of a compacted wearing course of suitable thickness, composed of such materials as gravel, broken stone, slag, sand, and natural soil binder which includes fine sand, silt and clay. These materials are either premixed or mixed-in-place in proper designed quantities and proportions to give all-weather supporting ability which is considerably greater than that of the natural soil. (See stabilizing process.)

—(See preservative.)

**Stabilized**—Made firm and unyielding. In soils, made firm and unyielding by the control of capillary moisture. A tentative recommendation limits the use of the word only when a soil density is 130 lb. per cu. ft. is obtained.

—**Grade**—In soil conservation, slope of a channel in which neither erosion nor silting occurs.

**Stabilizer** (aerostat)—Same as fin.

—(airplane)—Any airfoil whose primary function is to increase the stability of an aircraft. It usually refers to the fixed horizontal tail surface of an airplane, as distinguished from the fixed vertical surface.

—**Stub-Wing**—A projection from the side of the central hull of a flying boat intended to increase the buoyancy and stability of a flying boat while the boat is at rest and to increase the hydrodynamic lift during the take-off. It is an integral part of the hull, and usually takes the form of a stumpy airfoil or a stub wing.

**Stabilizing Process**—(after H. C. Porter, Research Engineer, Texas State Highway Commission) Any artificial work applied to any part

of the natural soil foundation, or to any part of the soil substructure or to the superstructure, to promote permanent subsequent non-change in its position, its volume, and its shape. Examples: 1. The proper selecting and placing of pervious non-expansive and non-plastic soils and of highly expansive and plastic soils, with relation to one another in the road structure, to facilitate drainage and protection of the highly expansive and plastic soils from being excessively wetted by rainwater, and from excessive loss of moisture during droughts. 2. The building of the soil-substructure in thin layers and the blading of each layer sufficiently to break up all nesting of different soil types to obtain homogeneity of the soil throughout the layer, or graded longitudinal transition from soil of one type to that of another in the layer. 3. The wetting of the entire soil structure when completed, by natural permeation of water ponded on top of it, to expedite the time of slaking of all clods in the soil structure, and bringing of it as nearly as is practical to its average subsequent density. 4. The maintaining, true to line and grade, of the surface of the completed natural-soil foundation or the soil structure, in order that depressions will not form to impound rainwater which will cause non-uniform action in the soil structure, and in order that the weathered soil need not require reshaping and disturbing for the receiving of the superstructure. 5. The bringing of the natural-soil foundation or the soil substructure to its average subsequent volume by placing its approximate average subsequent moisture in it immediately before the superstructure or any part thereof is placed. 6. The mixing of clay with sand at the top of the soil structure to provide better riding service during dry weather, and

vice versa. 7. The admixing of chemicals, oil, asphalt, or cement, etc., with a soil.

**Stable Effluent**—A treated sewage which contains enough oxygen to satisfy its oxygen demand.

—**Oscillation**—(aeronautic) An oscillation whose amplitude does not increase.

**Stadia**—1, A method of surveying in which distances from an instrument to a rod are determined by observing the space on the rod scale intercepted by two lines in the reticule of the telescope. 2, The instrumental equipment used in such a survey. (Stadia is also used as an adjective, in such expressions as "stadia rod," "stadia survey," "stadia intercept," "stadia hairs," "stadia distance.")

—**Rod**—A graduated rod used with an instrument of the stadia class to measure the distance from the observation point to the place where the rod is positioned.

**Staff Gage**—In hydraulics, a graduated scale on a staff, plank, metal-plate pier, wall, etc., by which the elevation of the water surface may be read.

**Stage**—(hydraulics) Elevation of a water surface above any chosen plane, often above an established low-water plane; gage height.

—**Construction**—The building of a highway by degrees, as the constructing of the substructure in one year, and the constructing of the subbase, the base, or the wearing-surface at a later date or dates, in order to allow time for the substructure, subbase, and base to weather; or, in order as funds become available for construction.

—**Filtration**—Trickling filters in series through which the sewage passes successively with or without intermediate sedimentation.

**Stagger**—To arrange in a zigzag order, as the staggering of rivets.

—A term referring to the longitudinal position of the axes of

two wings of an airplane. Stagger of any section is measured by the acute angle between a line joining the wing axes and a line perpendicular to the upper wing chord, both lines lying in a plane parallel to the plane of symmetry. The stagger is positive when the upper wing is in advance of the lower.

--**Wire**—A wire connecting the upper and lower wings of an airplane and lying in a plane substantially parallel to the plane of symmetry; also called "incidence wire."

**Stain**—A discoloration.

**Stake Dam**—In soil conservation, brush held in an advantageous place by staggered rows of stakes for the purpose of retarding water-flow velocity on a slope.

**Stalactite**—Depending, columnar deposits, generally of calcite, formed on the roof of a cavern by the drip of mineral solutions.

**Stalagmite**—Uprising, columnar deposits, generally of calcite, formed on the floor of a cavern by the drip of mineral solutions from the roof.

**Stall**—The condition of an airfoil or airplane in which it is operating at an angle of attack greater than the angle of attack of maximum lift.

**Stalling Speed**—The speed of an airplane in steady flight at its maximum coefficient of lift.

**Stanchion**—An upright post supporting a roof.

**Standard Atmosphere**—(aeronautic) An arbitrary atmosphere used in comparing the performance of aircraft. The standard atmosphere in use in the United States at present represents very nearly the average conditions found at latitude 40 deg. and is completely defined in N.A.C.A. Report No. 218.

--**International Atmosphere**—(aeronautic) The atmosphere used as an international standard presumes for mean sea level and a tempera-

ture of 15 deg. C., a pressure of 1,013.2 millibars, lapse rate of 6.5 deg. C. per kilometer from sea level to 11 kilometers, and thereafter a constant temperature of -56.5 deg. C.

--**Parallel**—(public land survey) A parallel of latitude, other than the base line, passing through a selected township corner on a principal meridian, and established for the purpose of limiting the convergence of range lines that intersect it from the south.

**Standing Rope**—A general term applied to guys and other stationary ropes.

--**Wave**—In hydraulics, a sudden rise in the water surface, generally fixed in position, such as a hydraulic jump; a standing wave may exist, however, where the principles of the hydraulic jump are not involved.

—(See stationary or standing waves.)

**Standpipe**—A tank in which the bottom is located at or near the surface of the ground, the interior of the entire structure being utilized for the storage of water.

—(hydraulics) A pipe or tank connected to a closed conduit and extending to or above the hydraulic grade line.

**Stannic**—Of, pertaining to, or containing tin.

**Stannite**—A sulphide of tin, iron, and copper, containing about 30 per cent sulphur, 28 per cent tin, 30 per cent copper, and 12 per cent iron.

**Starlings**—The two ends of a pier.

**Static**—Pertaining to or designating bodies at rest of forces in equilibrium.

--**Balanced Surface**—(aeronautic) A control surface whose center of mass is in the hinge axis.

--**Ceiling**—(aeronautic) The altitude in standard atmosphere, at which an aerostat is in static equilibrium

- after removal of all dischargeable weight.
- Static Deflection**—Deflection due to a quiescent load.
- Electricity**—Electricity at a state of rest, as distinguished from current electricity.
- Friction or Resistance Head, or Friction Loss**—In air conditioning, the static pressure necessary to overcome friction.
- Head**—(hydraulics) The total head without deduction for velocity head or losses; for example, the difference in elevation of head-water and tail water of a power plant.
- Metamorphism**—In geology, metamorphism produced by the internal heat of the earth and the weight of the superincumbent rocks and not accompanied by appreciable deformation.
- Pressure**—In acoustics, the pressure that would exist in the medium with no sound waves present. The unit is the dyne per square centimeter.
- (aeronautic) The force per unit area exerted by a fluid on a surface at rest relative to the fluid.
- In air conditioning, denotes the pressure, usually measured in inches of water, exerted by the air in a duct or fan at right angles to the direction of flow, or the pressure which is exerted in all directions in an enclosure independent of velocity pressure.
- Stability**—That property of an aircraft which causes it, when its state of steady flight is disturbed, to develop forces and moments tending to restore its original condition.
- Tube**—(aeronautic) A cylindrical tube with a closed end and a number of small openings normal to the axis, pointed upstream, used to measure static pressure.
- Station**—A distance of 100 feet measured along the center line and designated by a stake bearing its number.
- A set-up point; that is, a marked point on the ground, over which an instrument is to be placed.
- A length of 100 ft., measured along a given line, which may be straight, broken, or curved.
- Any point on a straight, broken, or curved line, whose position is indicated by its total distance from a starting point, or zero point. For example, "Station 4 + 47.2" identifies a point 447.2 ft. from the starting point, the distance being measured along a given line.
- Airship**—(See airship station.)
- Combination**—One in which some of the station tracks are connected at one end only and some of the tracks are connected at both ends.
- Error**—See Deflection of Plumb Line.
- Loop**—A form of through station in which the station track layout embraces a loop or part of a circle, trains being moved in one direction only and in the operation turned with reference to the station.
- Stub**—One in which the station tracks are connected at one end only.
- Through**—One in which the station tracks are connected at both ends.
- Transit**—(See transit station.)
- Stationary or Standing Waves**—In acoustics, stationary waves are the wave system resulting from the interference of waves of the same frequencies and are characterized by the existence of nodes or partial nodes.
- Tidal Wave**—A wave that oscillates about an axis, high water occurring on one side of the axis at the same time that low water occurs on the other side.
- Statistical Records**—Authenticated information or data in graphical, tabular or statement form relating to physical characteristics, conditions, costs and such other information

as may seem desirable for preservation, systematically gathered.

**Stay**—A rope used to support a vertical pole or mast, such as a derrick mast.

**Steady Flow**—A constant flow, that is, the same volume in equal units of time.

**Steamboat Jack**—A ratchet jack similar to and operating on the same principle as a steamboat ratchet, but with bearing shoes at the ends of the screws so that a pressure may be exerted between two objects or parts of a structure.

**Steam Hammer**—One which is automatically operated by the action of a steam cylinder and piston supported in a frame which rests on the pile.

—**Point**—(See ice point.)

—**Refined Asphalt**—Asphalt which has been refined in the presence of steam during the distillation process.

**Steatite**—A massive variety of talc; soapstone.

**Steel, Acid**—(See acid steel.)

—**Alloy**—A steel carrying a certain portion of some other metal, such as nickel, vanadium, etc.

—**Blister**—Steel made from wrought iron by heating it while in contact with some form of carbon.

—**Boiler**—A medium steel rolled into plates from one-fourth to one-half inch in thickness and used for making boilers.

—**Bronze**—An alloy of copper, tin, and iron used as gun metal.

—**Burnt**—(See burnt steel.)

—**Carbon**—Ordinary steel which contains no other alloying element than the usual amount of manganese.

—**Case**—The outside skin on steel caused by case hardening.

—**Case Hardened**—Steel with the outer skin hardened by heating, after being made into shape, with some such animal substance as grease, bone, hoofs, or horns.

—**Cast**—Steel that is cast into shape

directly from the furnace instead of being cast into ingots and rolled or melted.

—**Cemented**—(See cemented steel.)

—**Chrome**—Steel that usually contains two per cent of chromium and from eight-tenths of one per cent to two per cent of carbon. It is very hard and has a high elastic limit.

—**Converted**—Steel that has undergone a process of cementation in fire brick chambers or converting pots.

—**Crucible**—Steel made by melting down in a closed crucible the various grades of iron or steel with or without the addition of carbon, ore or other materials.

—**Deoxidized**—(See deoxidized steel.)

—**Fiery**—Burnt steel showing very coarse bright grains when fractured.

—**Gad**—Flemish steel wrought from wedge-shaped ingots.

—**High**—Steel containing a comparatively large amount of carbon, from one-half to one per cent.

—**Homogeneous**—(See homogeneous steel.)

—**Hot-Short**—(See hot-short steel.)

—**Ingot**—Steel run from the furnace into rectangular molds to be subsequently rolled or forged.

—**Low**—(See low steel.)

—**Manganese**—Steel containing from eleven per cent to fourteen per cent of manganese and one and one-half per cent of carbon. Also listed under manganese steel.

—**Mat**—A series of reinforcing bars welded, clipped, or otherwise fastened together, forming a reinforcing sheet.

—**Medium**—Steel neither very hard nor very soft, containing from one-fourth to one-half per cent of carbon. Also listed under medium steel.

—**Mild or Soft**—(See mild or soft steel.)

—**Nickel**—Steel containing from three per cent to five per cent of

nickel and from two-tenths to one-half per cent. of carbon.

**Steel Press**—A machine used in the manufacture of steel for pressing or squeezing out the slag. The action thereof may be continuous or intermittent.

—**Rivet**—(See rivet steel.)

—**Rolled**—(See rolled steel.)

—**Shear**—(See shear steel.)

—**Tempered**—(See tempered steel.)

—**Tool**—(See tool steel.)

—**Tungsten**—Steel usually containing from five to ten per cent of tungsten, and from four-tenths to two per cent of carbon.

—**Vanadium**—An alloy steel containing a small percentage of vanadium which has the effect of raising the elastic limit and ultimate strength of the metal.

—**Wild**—(See wild steel.)

**Step**—(aeronautic)—A break in the form of the bottom of a float or hull, designed to diminish resistance, to lessen the suction effects, and to improve control over longitudinal attitude.

—**Down Transformer**—In electricity, a transformer that changes high voltage alternating current into low voltage energy.

**Steptoe**—An island of bedrock in a lava flow.

**Stereo-Comparator** — (photographic mapping) An instrument for accurately measuring the three space coordinates of a point by stereoscopic observation of two images of the same point contained in two overlapping photographs taken from two different exposure stations.

**Stereometric Map** — (photographic mapping) A relief map made by application of the stereoscopic principle to aerial or terrestrial photographs. (Also called Stereotopographic Map.)

**Stereophotogrammetry**—The art of surveying by stereoscopic measurements of photographs.

**Stereoscopic Principle**—(photograph-

ic mapping) The formation of a single, three-dimensional image by binocular vision of two photographic images of the same terrain taken from different exposure stations. With proper equipment all measurements needed in map construction can be made from this visual model.

**Stereotopographic Map**—See Stereometric Map.

**Sterilization**—The destruction by the agency of some chemical, of all the bacteria in sewage or contaminated water, including their spores.

**Stern-Droop**—A deformation of an airship in which its longitudinal axis bends downward at the after end.

**Sternheavy**—The condition in which, in normal flight, the after end of an airship tends to sink and which requires correction by means of the horizontal controls. It may be due to either aerodynamic or static conditions, or to both (cf. bow-heavy).

**Stern-Weighing Device**—An instrument located near the stern of an airship for measuring its buoyancy (cf. bow-weighing device).

**Stibnite**—An antimony mineral having the formula  $Sb_2S_3$ , or sulphur about 29 per cent and antimony about 71 per cent.

**Stickers**—Plastering lath, or like material, used to separate lumber in storage.

**Stiffened Suspension Bridge**—A suspension bridge with stiffening trusses.

**Stiffener, Bow**—(aeronautic) A rigid member attached to the bow of a nonrigid or semirigid envelope to reinforce it against the pressure caused by the motion of the airship.

**Stiffening Rib**—The webs in a shoe, casting, or baseplate.

**Stiffness**—The material property which is measured by the rate at

which the stress in a material increases with the strain.

**Stilling Basin**—A structure or excavation which reduces velocity or turbulence of falling water.

—**Well**—In hydraulics, a pipe, chamber, or compartment with closed sides and bottom except for a comparatively small inlet or inlets communicating with a main body of water. Its purpose is to dampen waves or surges while permitting the water level with the well to rise and fall with the major fluctuations of the main body.

**Stilted Arch**—An arch whose spring line has been carried above the impost to which it is attached.\*

**Sting**—(aeronautic) A light rod attached to and extending backward from a body for convenience of mounting when testing in a wind tunnel.

**Stinkstone**—A fetid limestone; boulders of phosphate rock.

**Stirrups**—Bars inserted into reinforced concrete beams to help resist diagonal tension and shear, generally U-shaped.

**Stock**—The raw material used for charging a furnace.

—Certificate of part ownership in an enterprise.

—A body of igneous rock intruded upward into older formations.

—(Book Value) The proportionate equity of a share of stock of a company as valued on the corporate books of account is called its book value. It is determined by taking the total assets and deducting liabilities and reserves and dividing the balance by the number of shares of stock.

—Material or equipment on hand to be used in sale or in making other material and equipment.

—**Common**—(See common stock.)

—**Pile**—Reserve material piled somewhere, readily available for subsequent operations.

—Material previously delivered and

conveniently stored in a pile for a definite job.

—**Preferred**—(See preferred stock.)

**Stock-pass**—A culvert or bridge opening under the roadway, primarily for the passage of stock.

**Stone**—Any natural rock deposit or formation of igneous, sedimentary and/or metamorphic origin, either in its original or altered form.

—**Block Pavement**—One having a wearing course composed of stone blocks quite or nearly rectangular in shape.

—**Boat**—A flat-bottomed sled for hauling heavy stones for short distances.

—**Chips**—Small angular fragments of stone containing no dust.

—**Crushed**—(See crushed stone.)

—**Drip**—(See drip stone.)

—**Filled Sheet Asphalt**—The name given to asphaltic concrete in which most of the mineral aggregate passes the 10-mesh sieve and conforms to the requirements for sheet asphalt. Use of this type of mixture is ordinarily confined to surface course construction.

—**Mason**—One who lays rubble, quarry or cobble stone in walls, piers, or abutments, trimming the stone to fit in the wall as it is built.

—**Sand**—Refers to the product (usually less than  $\frac{1}{4}$  in. in diameter) produced by the crushing of rock. This material is usually highly processed, and should not be confused with screenings.

**Stonegall**—A clay concretion found in certain sandstones.

**Stop**—(photography) See Diaphragm.

—**Cock**—An iron or brass body fitted with a plug ground to seat. An opening through the plug corresponds to the opening through the body.

—**Log**—In engineering, a log, plank, cut timber, steel, or concrete beam fitting into guides between walls or piers to close an opening to the

passage of water; usually handled one at a time.

**Storage Cell**—A secondary cell.

—**Dam**—A dam designed to store water during periods of surplus stream flow for use during periods of lower flow.

**Storm Drain**—A sewer or drain pipe for conveying storm and other surface water.

—**Overflow**—The weir or orifice for permitting the discharge from a combined sewer of that portion of the storm flow in excess of that which the sewer is intended to carry.

—**Overflow Sewer**—A sewer used to carry the excess of storm flow from a main or intercepting sewer to an independent outlet.

—**Sewer**—A sewer which carries storm and surface water, street wash, and other wash waters, or drainage, but excludes sewage.

—**Water**—That portion of the precipitation which runs off over the surface of the ground during a storm and for such a short period following a storm as the flow exceeds the normal or ordinary run-off.

—**Excess water during rainfall or continuously following and resulting therefrom.** (A.S.C.E.)

**Straight Edge**—A bar of wood or metal having a straight edge for testing straight lines or pavement surface.

—**Line Compressor**—In this class of machine the driving and compressing elements are placed in a horizontal position and in line with one another.

**Straight-run Pitch**—A pitch run to the consistency desired, in the initial process of distillation, without subsequent fluxing.

**Strain**—The unit extension or deformation of a body resulting from the application of a load. Thus the total extension of the piece divided by the length over which the extension is measured gives the

strain. The term is usually considered to mean the principal deformation—that occurring in the direction of the load.

—**Sheet**—Quarrymen's term for granite sheets produced by present compressive strain.

**Strand**—A uniformly twisted assembly of wires.

**Stranded**—Complete breakage of an entire strand, sometimes several.

**Stratification**—The deposition of sediment beds, layers, or strata; hence, the arrangement of rocks in such beds, layers, or strata; hence, further, the stratified structure resulting from such deposition and arrangement.

**Stratigraphy**—That branch of geology which treats of the formation, composition, sequence, and correlation of the stratified rocks as parts of the earth's crust.

**Stratigraphic Interval**—In geology, the distance, measured perpendicular to the bedding, between corresponding parts of any two strata in a sedimentary sequence.

**Stratum**—A bed or layer of rock.

**Straw-Boss**—Same as "pusher."

—One who acts for a foreman during the latter's absence.

**Streak Plate**—A piece of unglazed porcelain for testing the streak of minerals.

**Stream**—A body of flowing water, whether in an open or closed conduit; a jet of water as from a nozzle.

—**Enclosure**—A pipe or other conduit for carrying underground a stream which parallels a roadway or divides otherwise useful land into smaller parts.

—**Ephemeral** — (See ephemeral stream.)

—**Gaging**—In hydraulics, the measurement of the discharge of streams by means of current meters, weirs, or other devices.

—**Influent**—(See influent stream.)

**Streamline**—(aeronautic) The path of a particle of a fluid, supposed-

ly continuous, commonly taken relative to a solid body past which the fluid is moving; generally used only of such flows as are not eddying.

—**Flow**—(aeronautic) A fluid flow in which the streamlines, except those very near a body and in a narrow wake, do not change with time.

**Form**—(aeronautic) The form of a body so shaped that the flow about it tends to be a streamline flow.

**Street**—(or highway) The entire width between property lines of every way or place of whatever nature when any part thereof is open to the use of the public, as a matter of right, for purposes of vehicular traffic.

—A highway in an urban district.

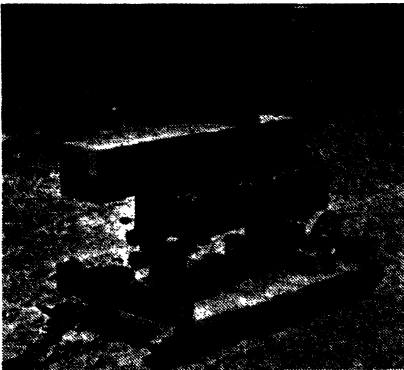
—**Car**—A car other than a railroad train for transporting persons or property and operated upon rails principally within a municipality.

—**Wash**—The liquid flowing on and from the street surface.

**Strength, Elastic** — (See elastic strength.)

—**Ultimate**—(See ultimate strength.)

**Stress**—The force exerted upon one body by another, or by one part of a body on the adjacent or adjoining parts. The latter is commonly called internal stress.



*Portable machine for obtaining stress on concrete, in the field*

—**Axial**—(See axial stress.)

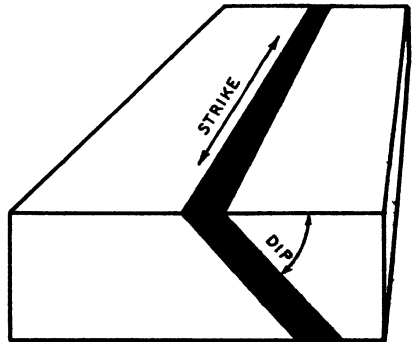
—**Diagram**—A skeleton drawing of a truss upon which are written the stresses in the different members.

**Stresses, Breathing** — (aeronautic) Stresses produced in an aerostat by breathing. They are of importance in the envelope and keel of a semirigid airship, due to the interaction of the envelope and keel when the envelope breathes.

**Stretcher**—A stone which has its greatest length parallel to the face of the wall.

**Stria**—A minute groove or channel.

**Strike**—(of rock) Is the direction of the line of intersection of the plane of stratification with the horizontal plane.



*Block diagram illustrating the dip and strike of a stratum of rock*

**Stringcourse**—In architecture, a horizontal treatment of moldings, or other projecting members, carried on the exterior walls of a building.\*

**Stringer**—A longitudinal member extending from panel to panel of a bridge and supporting the ties or the flooring.

—A short longitudinal beam directly supporting the floor.

**Stripping**—Removing the top soil layer containing vegetable matter or other stratum containing undesirable material, from a deposit intended to be used or worked.

- Strip Sodding**—To lay sod in strips separated by spaces not sodded.
- Structural Deterioration**—A term used in economics of highway planning which states that this condition may be the result of a physical disintegration of structural materials such as the corrosion of metal or the decay of timber, or it may result from external conditions such as traffic impact, erosion, fire, flood and accident.
- High**—In geology, the crest of a dome or an anticline.
- Low**—In geology, the bottom of a structural trough or syncline.
- Plain**—A gently sloping stratum plain.
- Timber**—Such products of wood in which the strength of the timber is the controlling element in its selection and use, such as trestle timbers; car timbers; framing for buildings; ship timbers; and cross arms for poles.
- Structure**—As referred to Portland cement, the size, form and configuration of the constituent compounds in the material.
- Strut**—A bridge member carrying compression.
- A secondary compression member; a brace.
- Angle**—A strut built up of angle irons.
- Counter**—A web member subject to both compression and tension.
- Longitudinal**—(See longitudinal strut or girt.)
- Portal**—A strut in the portal bracing of a bridge.
- Secondary**—A secondary member taking up compression.
- Sway**—A strut used in sway bracing.
- Strutting**—A process of elongating the vertical diameter of a pipe or decreasing the horizontal diameter until the fill is completed or compacted, after which the struts are removed, allowing the pipe to build up additional side support and resume its circular shape.
- Strutting may be done in the field with timbers, or in the shop with horizontal tie wires or rods. Bracing either horizontally or vertically.
- Stub Plane**—(See stabilizer, stub-wing.)
- Stud Bolt**—A bolt threaded at both ends.
- Stumpage**—The amount paid a land owner for standing timber.
- Stylobate**—In architecture, a continuous base carrying a colonnade, as in the Parthenon at Athens.\*
- Styolite**—A small, short, columnar structure, transverse to the bedding, common in some limestones and calcareous shales, and supposed to have been formed by differential vertical movement under pressure.
- Sub-Ballast**—Any material of a superior character, which is spread on the finished sub-grade of a railroad roadbed and below the top-ballast, to provide better drainage, prevent upheaval by frost, and better distribute the load over the railway roadbed.
- Subbase**—(after H. C. Porter, Research Engineer, Texas State Highway Commission) That part of the natural-soil foundation, or of the soil substructure which receives treatment or preparation different from the remainder thereof, and upon which both a base and wearing surface, of different designs, are placed; or any material placed on the top of the natural-soil foundations, or placed upon the top of the soil substructure, of different types or with different methods of placing, and upon which both a base and wearing surface of different designs are placed. Examples: 1. That part of the upper portion of the natural-soil foundation which is treated with oils, chemicals, water, etc., by permeation without rupturing the natural structure of the soil; or that part of the upper portion of

the soil substructure which is treated with oil, chemicals, water, asphalt, tar, cement, etc., either by permeation, or by scarifying and admixing, and upon which both a base and a wearing surface of different designs are placed. 2. A layer of sand-clay, caliche, sand, gravel, crushed stone, etc., placed on top of a natural clay-soil foundation or on top of a clay soil-substructure, and upon which both a base and a wearing surface of different designs are placed.

**Sub-Chord**—Any chord of a circular curve whose length is less than that of the chord adopted for laying out the curve. In a "railroad curve," for example, a subchord is a chord less than 100 ft. in length.

**Subcritical Flow**—(hydraulics) Flow at velocities less than one of the recognized critical values; usually turbulent flow at a mean velocity less than Belanger's critical velocity; streaming flow.

**Subdrain** — A pervious-backfilled trench containing a pipe with perforations, open joints or porous walls for the purpose of intercepting ground water along its length or lowering the water table.

—A drain built below the grade of a pipe, culvert, or the lining of a canal, to carry off the seepage.

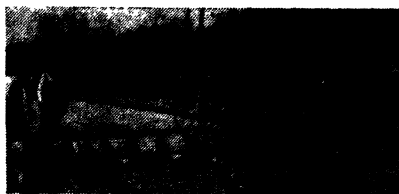
**Subgrade**—(noun) In railway use, the finished surface of the roadbed before the application of ballast or track.

—In highway use, the surface of a portion of the roadbed on which paving will be or is placed.

—In sewer work, the elevation of the bottom of a trench in which a sewer or drain is laid.

**Sub-Irrigation**—(1) Watering plants below the ground surface; (2) irrigation by a rising ground-water plane, or by control of the water-table.

**Sub-Joint**—Minor joints diverging from or parallel to the regular joints.



*Subgrade planer leveling and shaping subgrade*

**Submain or Branch Sewer**—A sewer into which the sewage from two or more lateral sewers is discharged.

**Submerged Orifice**—(hydraulics) An orifice which in use is drowned by having the tail water higher than all parts of the opening.

—**Outlet**—An outlet entirely covered by water. Pertaining to critical flow, it exists when the backwater diminishes the discharge of a conduit.

—**Type Vertical Pump**—(See vertical pump, submerged type.)

—**Weir**—A weir which in use has the tail-water level equal to or higher than the weir crest.

**Sub-Natant Liquor**—(in sewage)—Liquid separated from solids on which solids are floating.

**Sub-Punch**—To punch a hole smaller than the rivet to be used, so that the injured metal may be removed by reaming out to size.

**Subsidence**—(noun) That portion of an embankment which has settled below the original surface of the ground.

**Sub-soil**—The bed of earth immediately beneath the surface soil.

**Substructure**—All of that part of the structure below the bridge seats or below the spring line of arches or below the bottoms of caps of timber trestles.

—That part of any construction which supports the super-structure.

—**Soil**—(See soil substructure.)

**Sub-Strut**—A sub-diagonal carrying compression.

**Sub-surface Drainage**—The control

- and removal of excess moisture contained in the soil.
- Float**—A submerged body which is attached by a line to, and whose movement is indicated by, a surface float; used for the purpose of observing velocities.
- Irrigation**—The process in which sewage is distributed beneath the surface of the ground by means of open-jointed pipes.
- Water**—In ground water technology, all of the water that exists below the surface of the solid earth is called subsurface water, to distinguish it from surface water and atmospheric water.
- Subbing**—Sub-irrigating.
- Performing a portion of a general contract by a separate contract with the general contractor.
- Subcapillary Interstice**—In physics, one smaller than a capillary interstice in which molecular attraction spans the entire space and water is held immovable against gravity by the forces of adhesion alone.
- Subdivided Warren Truss**—A Warren truss with verticals having sub-diagonals and subverticals.
- Subharmonic**—In acoustics, a component of a complex wave having a frequency which is an integral submultiple of the basic frequency.
- Submergence**—The ratio of the tail-water elevation to the head-water elevation, using the crest of the overflowing structure as datum, when both head-water and tail-water are at higher elevations than the crest. The distances up or down stream from the crest at which head-water and tail-water elevations are measured are important, but cannot be prescribed.
- Substance, Thermal Capacity of**—(See thermal capacity of a substance.)
- Subway**—A structure which permits a highway to pass under a railway or under another highway; an underpass.
- Suction Pipe Line**—(See pipe line, suction.)
- Type Vertical Pump**—(See vertical pump, suction type.)
- Sudden Pull-Up (or Sudden Pull-Out)** (stress analysis)—(aeronautic) A loading condition for the tail surfaces resulting from a sudden application of up-elevator (cf dive).
- Sugary Quartz**—A granular and somewhat friable and massive variety of quartz.
- Sulphate Resistance**—Refers to the resistance of a concrete structure to attack by sulphate solutions.
- Summation Appraisal**—The process of appraisal based upon the adding together of parts of a property separately appraised to form the whole; e. g., as applied to appraisals of improved properties, the determination of the sum of the whole by adding to the value of the land, as vacant, the "cost of reproduction less depreciation" of the improvements.
- Summerwood**—The outer, usually harder and less porous portion of each annual ring.
- Sump**—A well into which water may be conducted by ditches to drain other portions of the work.
- Sun Compass**—A compass in which the direction of the sun is utilized instead of the direction of the magnetic north or south pole.
- Supercement**—A trade name for a cement to which a small percentage of "Catacoll" (tannin) has been added with the gypsum at the time of grinding.
- Supercharge**—To supply an engine with more air or mixture than would be inducted normally at the prevailing atmospheric pressure. The term supercharged is generally used to refer to conditions at altitudes where the pressure in the intake manifold is partly or completely restored to that existing under normal operation at sea level (cf. boost).

**Supercharged Engine**—An engine with a compressor for increasing the air or mixture charge taken into the cylinder beyond that inducted normally at the existing atmospheric pressure.

**Supercharger**—A pump for supplying the engine with a greater weight of air or mixture than would normally be inducted at the prevailing atmospheric pressure.

—**Control: Bypassing (Roots)**—Regulating the pressure of the air supplied to the carburetor by discharging into the free atmosphere the excess delivered by the supercharger.

**Superelevation**—In roadbuilding, the height or rate of rise of the outside of a curved roadbed or pavement over the inside edge.



*Paving on a superelevated curve*

**Superficial Coat**—A light surface coat.

**Superheat**—(aeronautic) The amount by which the temperature of the gas in the envelope or gas cells of an aerostat exceeds the temperature of the surrounding air. If the gas has a lower temperature, the superheat is said to be negative.

**Super-Natant**—Floating on surface, like oil on water.

—**Liquor (in sewage)**—Liquid floating above the solids which have been precipitated from it, or thrown down by subsidence.

**Superpressure**—The excess of pressure at the bottom of an airship gas cell or envelope over the outside atmospheric pressure.

**Superheat Steam**—Steam heated to a temperature above that due to its pressure.

**Supersensitive Film or Plate**—(photography) A trade name for a plate or film coated with an emulsion which requires an extremely short exposure time. (Unlike the obsolete, "hypersensitized" film, this material need not be kept at uniform temperature.)

**Superstructure**—All of that part of the structure above the bridge seats or above the spring line of arches, or above the bottoms of caps of timber trestles.

—That part of a structure which receives the live load directly.

**Suppressed Weir**—(hydraulics) A measuring weir notch the sides of which are flush with the channel, thus eliminating end contractions of the overflowing water. A weir may be suppressed on one end, two ends, bottom, or any combination of them.

**Surety**—The individuals or company signing, as guarantors, the performance bond furnished by the contractor.

**Surface Area**—The overall surface of a pulverized material usually expressed in square centimeters per gram.

—**Aeration**—Same as bio-aeration.

—**Coating**—The application of a liquid by brush or spray for the purpose of waterproofing or damp-proofing.

—**Curve**—(1) The longitudinal curve assumed by the surface of water flowing in an open conduit; the surface curve is the curve of equilibrium of all forces acting on the flowing water; (2) the hydraulic grade line.

—**Drainage**—The removal or control of surface water by means of crowned or sloping surfaces, parallel or side ditches, and culverts or cross drainage; also by means of sewers and surface intercepting drains as on airports. Flow of

- water from a land or roadway surface.
- Surface Evaporation**—Evaporation from the surface of a body of water, snow, or ice.
- Float**—A float on a water surface used to indicate velocity or direction of flow.
- Neutral**—(See neutral surface.)
- Profile**—(hydraulics) The longitudinal profile assumed by the surface of a stream of water flowing in an open channel.
- Removal Method**—(for brick pavement) The modern method by which excess asphalt is completely removed from the surface, exposing the anti-skid wire cut surface to traffic.
- Running** (tread)—The top part of railroad track structures on which the treads of the wheels bear.
- Slope**—In hydraulics, the inclination of the water surface expressed as change of elevation per unit of slope length; the sine of the angle which the water surface makes with the horizontal. The tangent of that angle is ordinarily used, no appreciable error resulting except for the steeper slopes.
- Tension**—The tension exhibited by the free surface of liquids measured in dynes per centimeter.
- Track**—The condition of the railroad track as to vertical evenness or smoothness.
- Treatment**—In wood preservation, the superficial application of a liquid preservative to wood by brushing, spraying or dipping.
- Treatment**—In bituminous work, any surface that has a final thickness less than 1 inch.
- Treatment**—(See bituminous surface treatment.)
- Water**—That portion of the precipitation which runs off over the surface of the ground.
- Water**—(of aggregates) The water carried by the aggregates except that held by absorption within the aggregate particles themselves.
- Surfacing**—(1) The crust or pavement. (2) Constructing a crust or pavement. (3) Finally finishing the surface of a roadway. (4) Treating the surface of a finished roadway with a bituminous material.
- Surficial**—A common name for the unmoved surface of the earth, alteration products of igneous rocks.
- Survey**—The act or operation of surveying; as, "a survey was made."
- The results of such an operation, that is, the assembled data; as, "the survey showed that the shore line was receding."
- An organization carrying on surveying operations; for example, the U. S. Coast and Geodetic Survey.
- Surveying**—The science of measuring land and/or water distances and/or angles in the vertical and/or horizontal directions such that errors are exactly controlled and/or adjusted. The science includes applications of astronomy and bearings to the earth's surface for the purpose of measuring and/or calculating areas, lines, angles, directions or volumes; in plane surveying the curvature of the earth's surface is not taken into account, in geodetic surveying it is.
- Specifically, in Civil Engineering, the science or art of making such measurements as are necessary to determine the relative position of points on or beneath the surface of the earth, or to establish such points.
- Plane**—(See plane surveying.)
- Suspended Load**—The portion of stream load made up of particles having such density or grain size as to permit movement far above and for long distances out of contact with the stream bed.
- Matter**—Undissolved particles of matter in water which may be removed by filtration and/or sedimentation.
- Solids**—The solids, both organic and inorganic, that are not held in solution in a sewage or effluent;

these solids being quantitatively determined in the laboratory by retention on filter paper.

—**Subsurface Water**—In ground water technology, the subsurface water above the zone of saturation, that is, the water in the zone of aeration, is called "suspended subsurface water" or "vadose water."

—**Water**—In hydrology, subsurface water partially occupying interstices in the zone of aeration. It comprises hygroscopic, pellicular, mobile, and fringe water.

—**Suspender**—A hanger used to suspend a floor from a cable or from a truss or other object.

—**Suspension Band**—A horizontal fabric band, securely fastened to the envelope of a balloon or airship, to which are attached the main suspension lines of the basket or car, or the captive cable of a kite balloon.

—**Bar** (or ring)—A bar to which the suspension ropes of the balloon basket are secured. It is also fitted with ropes and toggles for attachment to the basket suspensions from the envelope or net; also called "trapeze bar."

—**Basket**—The suspension by means of which the basket of a kite balloon is supported beneath the balloon body proper. It is independent of the winch suspension.

—**Bridge**—A bridge supported by cables or other flexible tension members.

—**Line**—A line attached to the hull or envelope of an airship for supporting an appendage, such as a car or fin.

—**Patch**—A patch, secured to the envelope or to a gas cell of an aerostat, to which a suspension line may be attached.

—**Rod**—One of the rods attached to the cable of a suspension bridge for the purpose of supporting the floor.

—**Winch**—The rigging by means of which the lift and drag of a kite balloon are transmitted from the envelope to the towing or traction cable.

—**Swamp**—A general term for flat, wet areas, intermittently covered by standing water and supporting a growth of trees, shrubs, plants, etc.

—**Sway Brace**—A member bolted or spiked to a bent and extending diagonally across its face.

—**Bracing**—Bracing transverse to the planes of the trusses; used to resist wind pressure and to prevent undue vibration.

—**Sweating**—A method of fastening two metallic surfaces together by means of a very thin layer of solder.

—**Swedge Bolt**—(See bolt, swedge.)

—**Sweep**—The curve or bend in a stick of lumber.

—The long curve or bend of a road.

—**Rail**—Two flexible parts attached to the front of a railway track car in such a location as to brush from the rail, as the car moves forward, any easily removable obstruction on the top of the rail.

—**Sweepback**—(aeronautic) The acute angle between a line perpendicular to the plane of symmetry and the plan projection of a reference line in the wing.

—**Swell**—The term swell as applied to grading material is the difference in volume between the material excavated and the ultimate volume of the same material in the embankment after it has reached a state of equilibrium, when the latter is the greater.

—**Swelled Column**—A column that is larger at the middle than at the ends.

—**Swing**—(vertical aerial photography) The angle on the vertical photograph between the principal line and the positive direction of the Y-axis of the photograph.

—**Offset**—The perpendicular dis-

tance from a point to a transit line found by holding the zero point of a tape at the given point and swinging the (taut) tape in an arc until the minimum (horizontal) distance is obtained.

—**Span**—A span that revolves on a center pier or from an end pier to allow a passage for vessels through the bridge.

**Swinging Rope**—The wire rope used to revolve a derrick, crane, power shovel, etc.

**Swipe**—To strike or drive with great force at an angle on the side of an object.

**Switch**—A track structure used to divert railway stock from one track to another.

—In electricity, a device that opens and closes an electric circuit.

—**Air Break**—(See air break switch.)

—**Angle**—The angle included between the gage lines of the railway switch rail at its point and the stock rail.

—**Cam**—(See cam switch.)

—**Double**—A combination of a crossing with two right-hand and two left-hand switches and curves between them within the limits of the crossing and connecting the two intersecting tracks on both sides of the crossing and without the use of separate turnout frogs.

—**Single**—A combination of a crossing with one right-hand and one left-hand switch and curve between them within the limits of the crossing and connecting the two intersecting tracks without the use of separate turnout frogs.

**Switchboard**—In electricity, a board fitted up with switches, by means of which electric circuits may be opened or closed.

**Switching Rope**—A short length of wire rope with steel fittings attached used for moving railroad cars.

**Swivel Socket**—A socket connection which permits relative rotation between the rope and that to which it is fastened.

**Syenite**—Any granular igneous rock composed essentially of orthoclase, with or without microcline, albite, hornblende, biotite, augite, or corundum. Syenites differ from granites in that they contain little or no quartz.

**Symbol**—(See conventional sign.)

**Symmetry**—A condition of equality or balance of shape, size, and position between similar parts of a figure or body about a central axis.

**Syncline**—A fold in rocks in which the strata dip inward from both sides toward the axis. The opposite of anticline.

**Synodical Month**—The month of the moon's phases, approximately 29½ days in length.

**Synthesis**—Art or process of making or "building up" a compound by union of simpler compounds or of its elements; opposed to analysis.

**System**—The term used in studies on phase equilibria to define the limits of chemical components under examination.

**Systyle**—In architecture, a treatment employing two diameters clear-  
ance between two adjacent columns.\*

# T

**T or Tee Iron**—Iron rolled into the shape of a bar having a cross section resembling the letter T.

**Tab**—An auxiliary airfoil attached to a control surface for the purpose of reducing the control force or trimming the aircraft.

**Table, Bartlett**—(See Bartlett table.)

**Tableland**—A plateau or elevated region of flat or undulating country rising to heights of 1,000 feet and more above the level of the sea.

**Tachometer**—An instrument that measures in revolutions per minute the rate at which the crankshaft of an engine turns.

**Tackle**—An arrangement of rope and sheave blocks for multiplying the leverage used for hoisting heavy loads or applying great pull.

—**Block**—A wire rope sheave or sheaves mounted between side members and provided with a hook or other form of attachment.

**Taconite**—A ferruginous chert which is the source of enormous deposits of iron ore in the Lake Superior region, by leaching of the silica from taconite the iron ore is formed.

**Taenia**—In architecture, the flat band or fillet separating the architrave and the frieze in the Truscan and Doric orders.\*

**Tag Line**—A light wire rope; used to prevent buckets from twisting, to guide loads being hoisted and to pull out skidder lines in logging.

**Tail, Airplane**—The rear part of an airplane, usually consisting of a group of stabilizing planes, or fins, to which are attached certain controlling surfaces such as elevators and rudders; also called "empennage."

—**Area**—(See area, measurement of.)

—**Boom**—(aeronautic) A spar or out-

rigger connecting the tail surfaces and the main supporting surfaces.

—**Drag**—A movable or variable weight suspended from the after part of an airship moored to a mast, to aid in restraining the vertical and lateral motions of the stern of the airship.

—**Rope**—Wire rope used in mine haulage and similar operation to make an endless circuit with the head rope for better controlling the movement of the loads.

—**Sheave**—A sheave for maintaining tension in a wire rope transmission or similar arrangement, also the return sheave or outer end sheave in an endless rope arrangement as on cableways.

—**Skid**—A skid for supporting the tail of an airplane on the ground.

—**Slide**—Rearward motion, relative to the air of an aircraft in flight.

—**Surface**—A stabilizing or control surface in the tail of an aircraft.

—**Water**—The water just downstream from a structure.

—**Wheel**—(See wheel, tail.)

**Tailheavy**—The condition of an airplane in which the tail tends to sink when the longitudinal control is released in any given attitude of normal flight (cf. noseheavy).

**Tailings**—Stones which after going through the crusher, do not pass through the largest openings of the screen.

**Tailless Airplane**—An airplane in which the devices used to obtain stability and control are incorporated in the wing.

**Tailrace**—A channel conducting water away from a waterwheel; an afterbay.

**Taintor Gate**—(See radial gate.)

**Take-Off**—The act of beginning flight in which an airplane is accelerated from a state of rest to

that of normal flight. In a more restricted sense, the final breaking of contact with the land or water.

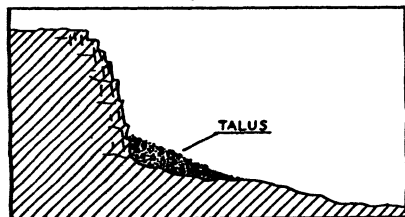
—**Distance**—The distance in which an airplane will finally break contact with the land or water, starting from zero speed. Take-off distance is considered in a calm or at a specified wind velocity.

—**Speed**—The air speed at which an airplane becomes entirely air-borne.

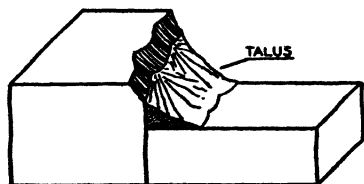
**Talc**—A hydrous magnesium silicate, of the formula  $H_2O, 3MgO.4SiO_2$ . Has a greasy or soapy feel and is soft and easily cut.

**Talc-schist**—In petrology, a schist in which talc, generally associated with mica and quartz, is the dominant schistose mineral.

**Tally**—To record or check off.



A



B

*Diagram showing the formation of "talus." (A) from a cliff, and (B) from a fault scarp*

**Talus**—A term used for the accumulation of fine, coarse, or mixed fragments and particles, fallen at or near the base of cliffs.

**Tamp**—To consolidate a material by pounding.

**Tamped** (or packed)—Packed down by light blows.

**Tamper, Air**—A pneumatic tool used for compacting loose materials. Commonly used in sets of 4, 8, or 12 tools in connection with portable air compressor of appropriate size.

—**Electric**—An electrically driven tool used for compacting loose materials. Commonly used in sets of 4, 8 or 12 tools in connection with portable generator set of appropriate size. (Electric tampers are of three general classes, vibratory, magnetic impulse, and mechanical impulse.)

—**Mechanical**—A power driven machine for compacting loose materials.

**Tamping**—Compacting loose materials by means of weights or weighted tools.

**Tangent**—Any straight portion of a railway alinement.

—Any straight portion of alinement between curve points of any survey.

—A straight line at right angles to the radius line of a curve, through the point of intersection of the curve and the radius.

—A straight line which touches a given curve at one and only one point, and which does not intersect it.

—That part of a traverse line, or alinement, included between the point of tangency of one curve and the point of curvature of the next curve.

—(public land survey) The line of a great circle normal to the meridian at a selected corner on a base line, standard parallel, or latitudinal township boundary.

—**Distance**—The distance from the point of curvature to the point of intersection (vertex), or from the point of intersection to the point of tangency.

**Tank Car**—A railroad car for transporting liquid or fluid materials;

generally 8,000 or 10,000 gallons capacity.

—(insulated) A tank car having a dual or protected shell to resist temperature change.

—**Seaplane**—An elongated tank filled with water through which models of seaplane floats, boat hulls, hydrovanes, etc., are towed, and the forces and moments on the model are measured.

—**Service**—(aeronautic) A fixed fuel tank near each power unit, into which fuel from other tanks is pumped and from which the fuel supplying the engine is drawn.

—**Treatment**—The detention of sewage or sewage sludge in tanks, either quiescent or with continuous flow.

**Tap**—A tool for cutting threads in a hole.

**Tape, Friction**—(See friction tape.)

**Taper in Plan Only**—(aeronautic) A gradual change (usually a decrease) in the chord length along the wing span from the root to the tip, with the wing sections remaining geometrically similar.

—**In Thickness Ratio Only**—(aeronautic) A gradual change in the thickness ratio along the wing span with the chord remaining constant.

**Taplets**—In electricity, fittings for rigid iron conduits.

**Tapping**—The removal of the molten steel from the open-hearth furnace by opening the tap hole and allowing the metal to run into the ladle.

**Tar Acids**—Compounds of carbon, hydrogen and oxygen found in various tars, intermediate in character between acids and alcohols. Those most common in coal-tar are carboic acid and cresylic acid.

—**Barbados**—(See Barbados tar.)

—**Coal, Gas-house**—(See gas-house coal tar.)

—**Refined**—(See refined tar.)

—**Water-gas**—(See water-gas tar.)

**Tars**—Black to dark-brown bituminous condensates which yield sub-

stantial quantities of pitch when partially evaporated or fractionally distilled, and which are produced by destructive distillation of organic material, such as coal, oil, lignite, peat and wood.



*Photo courtesy Hetherington and Berner, Inc.*

*Portable hot-mix bituminous paving plant*

**Taxi**—To operate an airplane under its own power, either on land or on water, except as necessarily involved in take-off or landing.

**Taxiway**—A specially prepared area over which airplanes may taxi to and from the landing area of a landing field.

**Technical Societies**—(Abbreviations of major associations):

—**A.A.A.**—American Automobile Association.

—**A.A.A.S.**—American Association for the Advancement of Science.

—**A.A.E.**—American Association of Engineers.

—**A.A.P.T.**—Association of Asphalt Paving Technologists.

—**A.A.S.H.O.**—American Association of State Highway Officials.

—**A.C.C.A.**—American Concrete Contractors Association.

—**A.C.I.**—American Concrete Institute.

—**A.C.P.A.**—American Concrete Pipe Association.

—**A.C.S.**—American Ceramic Society.

—**A.C.S.**—American Chemical Society.

—**A.E.C.**—American Engineering Council.

- A.F.A.**—American Forestry Association.
- A.F.A.**—American Foundrymen's Association.
- A.G.C.**—Associated General Contractors of America.
- A.H.O.N.A.S.**—Association of Highway Officials of the North Atlantic States.
- A.I.**—The Asphalt Institute.
- A.I.A.**—American Institute of Architects.
- A.I.C.E.**—American Institute of Chemical Engineers.
- A.I.E.E.**—American Institute of Electrical Engineers.
- A.I.M.M.E.**—American Institute of Mining and Metallurgical Engineers.
- A.I.S.C.**—American Institute of Steel Construction.
- A.M.A.**—Automobile Manufacturers' Association.
- A.P.I.**—American Petroleum Institute.
- A.R.B.A.**—American Road Builders' Association.
- A.R.E.A.**—American Railway Engineers' Association.
- A.S.C.E.**—American Society of Civil Engineers.
- A.S.H.V.E.**—American Society of Heating and Ventilating Engineers.
- A.S.L.A.**—American Society of Landscape Architects.
- A.S.M.E.**—American Society of Mechanical Engineers.
- A.S.M.E.**—American Society of Municipal Engineers.
- A.S.R.E.**—American Society of Refrigerating Engineers.
- A.S.T.M.**—American Society for Testing Materials.
- A.W.P.A.**—American Wood Preservers' Association.
- A.W.W.A.**—American Water Works Association.
- B.O.C.A.**—Building Officials Conference of America.
- B.P.R.**—United States Bureau of Public Roads.
- C.C.A.**—Calcium Chloride Association.
- C.S.I.**—Cast Stone Institute.
- C.S.R.I.**—Concrete Steel Reinforcing Institute.
- E.I.C.**—Engineering Institute of Canada.
- G.S.A.**—Geological Society of America.
- H.R.B.**—Highway Research Board.
- I.T.E.**—Institute of Traffic Engineers.
- L.P.P.A.**—Lime Putty Products Association.
- N.A.C.A.**—National Advisory Committee for Aeronautics.
- N.B.S.**—National Bureau of Standards.
- N.C.C.P.A.**—National Cinder Concrete Products Association.
- N.C.M.A.**—National Concrete Masonry Association.
- N.C.S.A.**—National Crushed Stone Association.
- N.E.I.A.**—National Engineering Inspection Association.
- N.E.R.B.A.**—New England Road Builders' Association.
- N.H.U.C.**—National Highway Users Conference.
- N.L.A.**—National Lime Association.
- N.L.M.A.**—National Lumber Manufacturers' Association.
- N.P.B.M.A.**—National Paving Brick Manufacturers' Association.
- N.S.A.**—National Slag Association.
- N.S.C.**—National Safety Council.
- N.S.G.A.**—National Sand and Gravel Association.
- N.S.P.E.**—National Society of Professional Engineers.
- N.T.M.A.**—National Terazzo and Mosaic Association.
- P.C.A.**—Portland Cement Association.
- R.S.B.A.**—Rail Steel Bar Association.
- S.A.E.**—Society of Automotive Engineers.
- S.L.B.A.**—Sand Lime Brick Association.

- S.P.E.E.**—Society for the Promotion of Engineering Education.
- W.R.I.**—Wire Reinforcement Institute.
- W.S.E.**—Western Society of Engineers.
- Tectonic**—Pertaining to the rock structures and external forms resulting from the deformation of the earth's crust.
- Teeming**—The pouring of molten steel from the ladle into ingot molds.
- Tee, Wind**—(See wind tee.)
- Telemeter**—An instrument of electrical device for recording the readings of a measuring instrument.
- Telephoto Lens**—(photography) A combination of positive and negative lenses designed to obtain larger magnification of distant objects than is possible with ordinary lenses.
- Teletype**—An electric communication system that reproduces received messages in printed form.
- Telford**—Properly an artificial foundation advocated by Thomas Telford (1757-1820), and consisting of a pavement of stone about eight inches thick, laid by hand, closely packed and wedged together. The individual stones were desired to be about sixteen square inches in section and about eight inches in length. They were set close together on the prepared subgrade, their longest dimensions vertical and on their larger ends, their interstices clinched with smaller stones, and the whole rammed (or rolled) until firm and unyielding.
- Temperature Coefficient**—(See coefficient of temperature.)
- Rankine Scale of**—(See Rankine scale of temperature.)
- Tempered Steel**—Steel that has undergone a definite heating and cooling process.
- Tempering**—Reheating after hardening, to some temperature below the critical temperature range, followed by any rate of cooling.
- Templet**—In railroading, usually a piece of thin metal of the exact size and shape of the finished rail section, but it may be of the size and shape of the rail section when hot, or the reverse of the shape to be fitted over a hot or cold rail to check its shape.
- A pattern, gauge or form for laying out or testing a surface.
- Fishing**—A templet shaped to fit between the head and base of the rail and used to determine whether the rail section is accurately formed in the fishing spaces to receive the joint bars.
- Temporary Structure**—Used in erosion control to refer to any mechanical structure used to retard erosion or waterflow, and constructed of non-durable materials in a manner to insure beneficial use over as short a period as one or two seasons.
- Tenacity**—That property of a body by which it resists being pulled apart.
- Tender**—Bid price, as in contracting business.
- Tenderness**—The relative resistance of a material to failure induced by localized stress at some weakened point, such as sharp corners and shoulders, notches, screw threads, and similar points.
- Tensile Strength**—The maximum pulled load per square unit of original cross-section that a material is able to withstand.
- Tension Member**—A member of a structure subjected to pulling stress only.
- Surface**—(See surface tension.)
- Tentative Valuation**—A tentative report by the Interstate Commerce Commission to Congress on each common carrier, made pursuant to Section 19a of the Interstate Commerce Act, setting forth the Commission's tentative findings of fact, as specified by law, and its findings of the value for rate-making purposes of property owned or

used by such common carrier for common carrier purposes, and certain other information prescribed by law on its non-carrier property, served upon each common carrier owning or using any part of such common carrier property, and upon certain other parties specified by law, as a basis for receiving testimony and hearing argument from all interested parties concerning a final report by the Commission to Congress of its findings of such facts and values for such common carrier.

**Tepetate**—In geology, a secondary volcanic or chemical non-marine



*Photo courtesy R. L. Vazquez*

*Tepetate surfacing on Mexican highway*

deposit, very commonly calcareous coating the solid rock or penetrating the earthy portions of a district; so-called in Mexico and Central America. A Mexican word for volcanic tuff.

**Tephrite**—In petrology, a basaltic rock containing plagioclase and nepheline or other soda-feldspathoid.

**Terminal**—In railroading, an assemblage of facilities provided by a railway at a terminus or at an intermediate point for the handling of passengers or freight and the receiving, classifying, assembling and dispatching of trains.

—The end.

—The end of a movement in transportation.

—**Freight**—A terminal provided for handling freight traffic.

—**Moraine**—The transported debris left by a glacier at or near its lower terminus.

—**Passenger**—A terminal provided for handling passenger traffic.

—**Rail and Water**—A terminal where traffic is transferred between railway cars and boats.

—**Speed**—(See velocity, terminal.)

—**Velocity**—(See velocity, terminal.)

**Ternary Compound**—A compound of three components.

**Terrace**—In soil erosion, a long, low embankment or ridge of earth constructed across a slope to control run-off and minimize soil erosion.

—**Channel**—The depression along the upper side of the terrace ridge in which the water flows to the outlet.

—**Crown**—The highest part of the terrace ridge; the top of a terrace.

—**Grade**—The slope of the terrace channel in inches or feet per 100 foot length. Terrace grades may be variable or uniform.

—**Outlet**—The end of the terrace at which the run-off is discharged; the lower end of a terrace channel.

—**System**—A complete series of terraces occupying a slope and discharging run-off into one outlet channel.

**Terra Cotta**—Clay baked in molds, used as a substitute for stone.\*

—**Rossa**—Red earth due to the weathering of rocks.

**Tertiary**—The earlier of the two geologic periods comprised in the Cenozoic era. Also the system of strata deposited during that period.

**Tesla Coil**—An oscillating transformer used in wireless work.

**Test, Base Metal**—In welding, a test specimen composed wholly of base metal.

—**Becke**—(See Becke test.)

- Chamber**—(aeronautic) (See experiment chamber.)
- Coke**—A test used to determine the amount of fixed carbon in bituminous materials.
- Cold**—(See cold test.)
- Distillation**—A test used to determine the proportion of oils and tars which distill between certain temperatures.
- Filler Metal**—In welding, a test specimen composed wholly of filler metal.
- Float**—A test used to determine the viscosity of bituminous materials, applied to creosote-coal tar solution as giving an indication of the proportion of tar in solution.
- Pile**—(See pile, test.)
- Pit**—An excavation to determine the nature of the material encountered, or to disclose the subsurface conditions.
- Specimen**—In welding, material specially prepared for test purposes.
- Specimen, Deposited Metal**—A test specimen substantially composed of deposited metal.
- Welded Joint**—A test specimen having one or more welds and primarily intended to compare the strength of the welded joint with that of the base metal.
- Weld Metal**—A test specimen having one or more welds with component base metal parts so shaped as to compel failure to take place in the weld metal.
- Tester, Haas**—(See Haas tester.)
- Tetracalcium Alumina Ferrite**—In cement technology, the iron containing compound of Portland cement. Commonly abbreviated to  $4\text{CaO} \cdot \text{Al}_2\text{O}_3 \cdot \text{Fe}_2\text{O}_3$  or  $\text{C}_4\text{AF}$ .
- Tetrahedrite**—A copper, antimony sulphide,  $\text{Cu}_8\text{Sb}_4\text{S}_{12}$ , containing about 23 per cent sulphur, 25 per cent antimony, and 52 per cent copper.
- Tetrastyle**—In architecture, a treatment employing four columns in line.\*
- Texture (of rock)**—The character,

arrangement, and mode of aggregation of the fragments, particles, or crystals that compose a rock; the sum total of those features of a rock which determine its physical structure and appearance as a rock.

**Thalweg**—(from German) The line following the deepest part of the bed or channel of a river. Originally, this word meant the line in the bottom of a valley in which the slopes of the two sides meet and which forms a natural water course.

**Theodolite**—An instrument for measuring horizontal and usually also vertical angles. A transit.

**Theoretical Weight**—As applied to steel shapes, the calculated weight per foot of a theoretical specimen of exact cross section dimensions. For a deformed reinforcement bar, the theoretical weight is that of the plain round or square of same nominal size.

**Thermal**—A term pertaining to heat.

—**Capacity of a Substance**—Is the quantity of heat necessary to produce unit change of temperature in unit mass. It is ordinarily expressed as calories per gram per degree Centigrade. Numerically equivalent to specific heat.

—**Resistance**—The opposition offered by a body to the passage of heat.

—**Stress**—In welding, the stress or stresses produced in a welded joint, welded structure or part cut by the heat of welding or cutting.

—**Thickness**—In the case of hollow tile, that dimension designed to lie at right angles to the face of the wall, floor, or other member in which it is used.

**Thermo-Cell**—A term for thermoelectric couple.

**Thermophilic Digestion**—Digestion by bacteria having their optimum range of activity between 50 and 60 degrees Centigrade.

**Thermostat, Liquid**—(See liquid thermostat.)

- Thickness Ratio**—(aeronautic) The ratio of the maximum thickness of an airfoil section to its chord.
- Thimble**—An oval shaped reinforcement around which the rope is bent when forming an eye.
- Thin Out**—Applied to beds or strata which grow gradually and continually thinner in one direction, until they disappear entirely.
- Section**—In petrography, a fragment of rock or mineral ground to paper thinness, polished and mounted between glasses as a microscopical slide.
- In cement technology, a section of cement clinker from 5 to 25 microns thick, used for the microscopic examination of the material.
- Threading**—In drainage, the process of installing a slightly smaller pipe or arch within a failing drainage structure.
- In mechanics, the process of cutting a continuous uniform spiraled groove on piece of cylindrical material.
- Threads, Cut**—Screw threads on a bolt or rod, formed by cutting away a portion of the material. The maximum diameter of the threaded portion of a bolt with cut threads is the same as the diameter of the bolt.
- Rolled**—Screw threads on a bolt or rod, formed by displacing but not removing a portion of the material. The maximum diameter of the threaded portion of a bolt having rolled threads is greater than the diameter of the bolt proper.
- Standard**—(See Brigg's standard.)
- Three-Point Landing** (stress analysis)—A loading condition for the fuselage and landing gear, representing landing with the wheels and tail skid touching the ground simultaneously (cf. level landing).
- Throat**—In welding, the minimum thickness of a fusion weld along a straight line passing through its root.
- Through Structure**—A structure whose main supporting members project above the deck.
- Thrust Collar**—A collar fastened to a shaft or axle by means of a set screw to prevent its shifting endwise.
- Effective Propeller**—(See propeller thrust, effective.)
- Propeller**—(See propeller thrust.)
- Static Propeller**—(See propeller thrust, static.)
- Tidal Basin**—A dock or basin without water gates in which water level changes.
- Current**—The horizontal backward and forward movement of the water brought about by tidal forces, the current floods and ebbs.
- Day**—Like the lunar day, the tidal day has an average length of 24 hours and 50 minutes.
- Marsh**—Low, flat marshlands traversed by interlacing channels and tidal sloughs and usually inundated by high tides.
- Tide**—The vertical movement of the water—the tide rises and falls.
- Level**—(See Mean Tide Level.)
- Tie**—A tension member of a truss.
- A timber bedded in ballast or on the railroad roadbed for supporting the rails.
- A connecting bar or rod.
- A piece of wood, metal or other material, in tension, between adjacent posts.
- Tie**—Linear or angular measurements or a combination of the two made for the purpose of locating other points from points of known position. Ties may be made to connect physical objects with the survey line, or to locate the instrument point with reference to physical objects so that it can be re-established if lost. To "tie in" is to close a survey on itself or on another survey; or to locate a point by means of ties.
- Adzed**—Tie prepared with smooth surface at the rail bearing points.
- Bar**—In Portland cement concrete

- pavement, a bar or device preventing expansion or contraction.
- Tie, Line**—A line used in a phase diagram connecting two components of a binary system.
- Plate**—A plate interposed between a railroad rail or other track structure and a tie.
- (See plate, tie.)
- Plug**—Wooden plug used for filling old spike holes; usually treated with a preservative.
- Point**—Point of closure of a survey either on itself or on another survey.
- Rod**—A bar, threaded at both ends, which ties a timber abutment or timber wing walls to the dead man or to each other.
- A rod connecting parts of a structure.
- Wire**—In electricity, a short piece of wire used by linemen for fastening line wires to insulators.
- Tight Sand**—In geology, the sand whose pores are so few or so filled with a cementing medium as to stop the flow of water or oil through it.
- Tile, Book**—Hollow tile with tongue and groove edges resembling a book in shape.
- Drain**—An underground drain constructed of clay or cement pipe.
- End-Construction**—Hollow tile designed to receive its principal stress parallel to the direction of its cells.
- Foundation**—Hollow tile for use as a load-bearing structural unit in foundations.
- Furring**—Tile of suitable design for lining the inside of walls and carrying no superimposed load.
- Hollow**—Hollow building units with parallel cells.
- Hollow Floor**—Hollow tile for use as a load-bearing structural unit in floors.
- Interlocking**—(See interlocking tile.)
- Partition**—Hollow tile for use in building interior partitions, subdividing areas into rooms or enclosing stairways or shafts, and carrying no superimposed load.
- Salt-Glazed**—Clay hollow tile with a vitreous glaze on its surfaces produced by burning salt in the kiln at the temperature used in finishing the burning.
- Till**—A mixture of clay and boulders deposited by glaciers.
- Tillite**—A sedimentary rock composed of cemented till.
- Tilt**—To forge with a tilt hammer.
- (aerial photography) The angle between the lens axis and a vertical through the exposure station (rear nodal point of lens).
- Axis of**—The line of intersection of the photograph plane and a horizontal plane at the same focal distance from the lens. (Note that the photograph has not been tilted on this axis, but about the rear nodal point of the lens.)
- Direction of**—The azimuth of the normal to the axis of tilt.
- Tilting Gate**—A gate hinged at top or bottom and counterbalanced by weights, automatically opening or closing with the change in head.
- Time, Unit of**—(See unit of time.)
- Tin, Block**—(See block tin.)
- Tinned Wire**—In electricity, a copper wire coated with tin so that solder will more readily stick to it.
- Tint**—A color produced by the admixture of a coloring material, not white, with a white pigment or paint, the white predominating.
- Tip Radius** (or propeller radius)—(aeronautic) The distance of the outermost point of a propeller blade from the axis of rotation.
- Tit**—A small accidental projection on a casting.
- Toe**—The lowest downstream edge of a dam or structure.
- The line of a fill slope where it intersects the natural ground, and the lowest edge of a backslope of a cut where it intersects the road-bed.

- The lower front portion of an abutment or retaining wall footing.
- In welding, the edge of a fusion weld formed by the intersection of a face and the base metal.
- Toenails**—Curved joints intersecting the sheet structure, in most places striking with the sheets, in some differing from them in strike 45 degrees or more.
- Toggle**—A mechanical device consisting of two bars or plates hinged together at their common ends and pivoted at the other ends; used for transmitting a force laterally to its line of application.
- Riveter**—A riveting machine using a toggle mechanism to give the pressure required to upset the stem and form the rivet head.
- Tolerance**—An allowable variation from dimensions or requirements specified.
- Tolerant**—Designates that a plant is agreeable to its surroundings, as to soil, moisture, climate, etc.
- Ton, Short**—A unit of weight, generally equal to two thousand pounds.
- Long**—A unit of weight equal to two thousand two hundred and forty pounds.
- Tone**—The color which principally modifies a hue in a white or a black.
- Pure** (simple)—(See pure tone.)
- Tongs, Chain**—(See chain tongs.)
- Tongue Plate**—A plate riveted on to the end of a member and projecting beyond it, in order to make a connection with another member.
- Tool, Grafting**—(See grafting tool.)
- Heading**—(See heading tool.)
- Steel**—Steel which, by special treatment or peculiar composition with alloying metals, is adapted to retain a cutting edge at comparatively high temperatures so as to permit of high cutting speeds.
- Tooled Finish**—Having surface formed by dressing with bush hammer, crandall or other desired tool to a uniform depth and finish.
- Top Lateral Bracing**—Lateral bracing in the plane of the top chords.
- Topaz**—A complex silicate containing aluminum, silica, fluorine. Number eight (8) in the scale of hardness for minerals.
- Top-Ballast**—Any material of a superior character spread over a sub-ballast to support the railway track structure, distribute the load to the sub-ballast, and provide good initial drainage.
- Of Slope**—The intersection of a slope with the ground surface in cuts, and the plane of roadbed on embankment.
- Topographic Map**—A scale representation, by means of conventional signs, of a part of the earth's surface, showing the culture, relief, hydrography, and, frequently, the vegetation.
- Topography**—The configuration of a surface, including its relief, the position of its streams, lakes, roads, cities, etc., as a map showing the topography of a given area; lay of the land.
- Topped Crude Petroleum**—A residual product remaining after the removal, by distillation, or other artificial means, of an appreciable quantity of the more volatile components of crude petroleum.
- Topping**—(levee) Temporary work to raise level of top of levee. Done only in emergencies.
- Top-soil**—(road surface) A variety of surfacing used principally in the southeastern states, being the stripping of certain top-soils which contain a natural sand-clay mixture. When placed on a road surface, wetted and puddled under traffic, it develops considerable stability.
- The "top" layer of soil; refers to "good" soil and not "to the top," after original soil has been disturbed.
- Tops**—The unrefined distillate obtained in topping a crude petroleum.

- Toroidal Coil**—In electricity, a coil wound on an iron ring having a circular cross section.
- Torque**—The moment of a force or a system of forces tending to produce rotation. The starting capacity of a rotative machine.
- Stand**—A test stand on which the engine torque is measured.
- Torsion**—The twisting of a wire about its center. The force or stress of such twisting.
- Torus**—In architecture, a large semi-circular molding used in the base of columns.\*
- Total Stress**—The sum of all stresses at a section of a body.
- Toughness**—The relative degree of resistance to impact without fracture; the property of a material which enables it to absorb energy while being stressed above its elastic limit.
- Tow, Pull**—(noun) Water craft being navigated by power other than its or their own, the tow line between the power unit and the tow being in tension.
- Push**—(noun) Water craft being navigated by power other than its or their own, the power unit operating behind the tow.
- Tower**—A vertical structure consisting of two or more bents of framework connected by bracing.
- Bracing**—Bracing attached to the posts of towers.
- Coke**—(See coke tower.)
- Panel**—The longitudinal space or bay in a trestle or viaduct occupied by the tower.
- Towhead**—A bar covered with a grassy growth of young willows.
- Towing Hawser**—A large flexible wire rope used for towing boats.
- Sleeve**—A tubular fabric envelope towed by an aircraft and used as a target.
- Township**—(public land survey) A unit of survey located with reference to one of a number of established principal meridians, whose boundaries are normally on cardinal courses six miles apart.
- Town Truss**—A form of lattice truss having double chord systems and two web systems in different planes.
- Toxic**—Poisonous; capable of killing wood destroying organisms.
- Trabeated**—In architecture, a style such as the Greek, that employs the lintel to span openings instead of the arch.\*
- Tracery**—In architecture, ornamental pattern work in stone, used in the upper parts of Gothic windows, etc.\*
- Trachyte**—Any aphanitic or glassy igneous rock composed essentially of alkalic feldspar, with or without mica, amphibole pyroxene, and other accessories, or of rock glass having essentially the same composition.
- Tracing**—A drawing made on transparent cloth.
- Track**—In railroading, ties, rails and fastenings with all parts in their proper relative positions.
- Bad Order**—A track on which bad order cars are placed either for light running repairs or for subsequent movement to repair tracks.
- Body**—Each of the parallel tracks of a yard upon which cars are switched or stored.
- Bolt**—In railway use, a bolt with a button head and oval neck and a threaded nut designed to fasten together rails and splice bars and other rail joint fastenings.
- Caboose**—A track on which cabooses are held in a yard.
- Capacity**—The number of cars that can stand on that track in the clear.
- Chart**—A diagram showing the physical characteristics of roadway and track.
- Classification**—One of the body tracks in a classification yard, or a track used for classification purposes.
- Crane**—(also called maintenance crane) In railway use, a power

- operated locomotive crane of small capacity used principally for setting rails in the track in renewals, but having many similar applications in maintenance work.
- Track Laying Machine**—In railway use, a machine designed to minimize the manual labor of placing rails, fastenings, ties, and other materials.
- Map**—A plat showing existing physical plant, including tracks, bridges, buildings, water service and mains, leases, station facilities and all other physical and operating property.
- Pan**—A shallow trough located between railroad rails, from which water is taken by locomotives while in motion by means of a scoop located under the tender.
- Scale**—A scale especially designed for weighing railway equipment.
- Strand**—A track cable composed of a single large strand of round wires.
- Stringer**—A beam or girder carrying a track.
- Tractor Airplane**—An airplane with the propeller or propellers forward of the main supporting surfaces.
- Propeller**—(aeronautic) A propeller mounted on the forward end of the engine or propeller shaft.
- Trade Wastes**—(in sewerage) Liquid wastes from industrial processes.
- Traffic**—Pedestrians, ridden or herded animals, vehicles, street cars and other conveyances either singly or together, while using any street for purposes of travel.
- Lane**—A definite portion of the width of a pavement intended to accommodate one line of traffic.
- Traffic-Control Projector**—A projector designed to give light signals to an aircraft pilot.
- Trail**—A word used in roadside development to denote a footpath or track worn through a wilderness or wild area.
- Rope**—(See drag rope.)
- Trailing Edge**—(aeronautic) The rearmost edge of an airfoil or of a propeller blade.
- Train**—A rolling mill term applied to a series of pairs or sets of rolls connected together and driven by the same motor or engine.
- Train-Thrust Bracing**—Bracing in the plane of the bottom laterals which transfers the thrust of a braked train from the stringers to the trusses.
- Trajectory Band**—A band of webbing carried in a special curve over the surface of the envelope of an airship to distribute the stresses due to the suspension of the car.
- Transducer, All-Pass**—(See all-pass transducer.)
- Ideal**—(See ideal transducer.)
- Passive**—(See passive transducer.)
- Transfer Plant**—A loading conveyor remote from a concrete batching plant for loading proportioned batches from batch trucks into truck mixers.
- Slip**—A protected landing place for transfer boats with adjustable apron or bridge for connecting tracks on the land with those on the transfer boats.
- Transformer**—In electricity, the induction coil used to raise or lower the electro-motive force at any point of the circuit.
- Oil**—A mineral oil having a high flash point used in transformers as a cooling medium and as insulation.
- Polyphase**—(See polyphase transformer.)
- Step Down**—(See step down transformer.)
- Transient Currents**—In electricity, currents that flow for short periods of time only.
- Transit Line**—In surveying, an imaginary straight line between two transit stations.
- Station**—The point over which a surveying transit stands when in use.
- Transition**—(hydraulics) A short

conduit uniting two other conduits having different hydraulic elements; a conversion.

—**Curve**—See Spiral Curve.

—**Strip**—A section of the landing area adjacent to a runway or other hard-surfaced area, constructed of crushed stone, or other suitable material, properly bound, to insure the safe landing and taxiing of airplanes across such a runway or area in any direction.

—**Type**—A roadside development term referring to the areas between the formal and the informal planting in which the row planting gives way gradually and not suddenly to the irregular groups of trees of the rural roadside.

**Translatory Resistance Derivatives**—Resistance derivatives expressing the variation of moments and forces due to small changes in the translational velocities of the aircraft.

**Translucent**—Admitting the passage of light, as milk-quartz, but not capable of being seen through.

**Transom**—Horizontal bar separating door from sash above.\*

**Transpiration**—A process of vaporization of water from the breathing pores of leaves and other vegetable surfaces.

—**Ratio**—The ratio of the weight of water passing through a plant, to the weight of dry plant substance produced.

**Transverse Bracing**—Bracing which is perpendicular (or but slightly inclined) to the center line of the structure.

—**Fissure**—A progressive transverse fracture starting from a center or nucleus inside of the head of a rail from which the fracture spreads. The broken rail will show a smooth oval or round spot within the head, substantially at right angles to the axis of the rail, which will be bright when first exposed to the air. The nucleus will show a typical crystalline fracture

and the growing portion a typical detail fracture.

—**Shear**—A shearing action parallel to the transverse axis of a body.

**Trap**—Includes the dark-colored, fine-grained and dense igneous rocks composed essentially of the ferro-magnesian minerals, basic feldspars, and little or no quartz. The ordinary commercial variety of trap is basalt, diabase, or gabbro.

—(in sewerage)—A device to prevent sewer air from backing up and escaping through a plumbing fixture. When made of cast iron or vitrified tile, it may be of various forms defined as running trap, P-trap, S-trap, etc.

—**Alternating Return**—(See alternating return trap.)

**Trapezoidal Weir**—A contracted measuring weir whose notch is trapezoidal in shape.

**Trass**—This is the specific name for a light-colored volcanic tuff found in Germany.

**Traveling Crane**—A crane mounted on wheels and capable of being moved from place to place.

**Traveler**—A block or trolley for use on a ferry or cableway, which moves along the track strand.

—An inverted U-shaped structure mounted on movable treads which roll or slide on runways outside of the lines of bridge trusses in such a way that it passes completely up and over the entire bridge. It is used for constructing the bridge or other structure.

**Traveling Screen**—(hydraulics) A diaphragm, usually of canvas in a frame moved by water in the direction of flow, for purposes of measuring directly the mean velocity.

**Traverse**—Series of distances and angles, or distances and bearings, or distances and azimuths, connecting successive instrument points of a transit, compass, or plane-table survey. A traverse may be closed

or open, according to whether it does or does not return to the starting point.

**Travertine** — Calcium carbonate,  $\text{CaCO}_3$ , deposited from solution in ground and surface waters.

**Travis Tank**—A 2-story tank consisting of an upper, or sedimentation, chamber, with steeply sloping bottom, terminating in one or more slots through which the solids may slide as deposited into the lower or sludge digestion chamber, through which a predetermined portion of the sewage is allowed to pass for the purpose of seeding and maintaining bacterial life in the sludge and carrying away decomposition products, thus inducing digestion of the sludge attended by its reduction in volume.

**Tread**—The horizontal slab of a step on which the foot rests.\*

**Treating Cylinder**—In wood preservation, a horizontal steel tank in which timber is placed while being treated with preservative under pressure. A retort.

—**Pressure**—In wood preservation, the amount of pressure used in injecting the preservative into wood, usually expressed as pounds per square inch.

**Treatment**—In wood preservation, act or manner of treating; also the quantity of preservative specified or used, as "10-pound treatment."

—**Brush**—Application of one or more coats of a liquid preservative to the surface of timber with a brush.

—**Butt**—Preservative treatment applied to the lower, or butt end of posts and poles; usually by the open tank process or by brushing.

—**Empty Cell**—A treatment in which the cell walls in the treated portion of the wood remain coated with preservative, the cells being empty or only partially filled.

—**Full Cell**—A treatment in which the cells in the treated portion of the wood remain either partially

or completely filled with preservative.

—**Non-Pressure**—Process in which the preservative is applied to wood without pressure.

—**Open-Tank**—Process in which the timber is immersed in hot oil, for various lengths of time, and then immediately in cold oil. Also called "Hot and Cold Bath Treatment."

—**Pressure**—Process in which pressure is applied to force preservatives into wood.

—**Spray**—Application of one or more coats of a liquid preservative to the surface of timber with a spraying device.

—**Surface**—Superficial application of a liquid preservative to wood by brushing, spraying or dipping.

**Tree Root Protection**—A term used in highway construction and roadside development practice to describe the use of broken stone, slag, gravel or other porous material in covering the natural ground surface over the roots of trees which are to be covered with fill material.

**Trellis**—An ornamental lattice work designed to support vines.\*

**Tremie**—A cylindrical or other form of tube, with a funnel top or pocket used for depositing concrete in water.

**Trench**—A long relatively narrow excavation the depth of which is greater than its width.

**Trestle**—A bridge structure composed of bents or towers and supporting stringers or girders forming the floor system.

—**Wood**—A wood structure composed of upright members supporting simple horizontal members or beams, the whole forming a support for loads applied to the horizontal members.

**Triangle or Polygon of Forces**—If three or more forces acting on the same point are in equilibrium, the vectors representing them form, when added, a closed figure.

**Triangular Weir**—A contracted measuring weir notch with sides that form an angle with its apex downward; the crest is the apex of the angle; a V-shaped weir.

**Triassic**—The earliest of the three geologic periods comprised in the Mesozoic era. Also the system of strata deposited during that period.

**Tricalcium Aluminate**—In cement technology, one of the alumina compounds in Portland cement. Gives off a large amount of heat on hydration and reacts with sulphates in solution to form calcium sulphoaluminate. Commonly abbreviated to  $3\text{CaO} \cdot \text{Al}_2\text{O}_3$  or  $\text{C}_3\text{A}$ .

—**Silicate**—In cement technology, the principal compound of Portland cement and the one chiefly responsible for strengths at early ages; commonly abbreviated to  $3\text{CaO} \cdot \text{SiO}_2$  or  $\text{C}_3\text{S}$ .

**Trickling Filter**—An artificial bed of coarse material, such as crushed stone or clinkers, over which the sewage is distributed as a spray from fixed nozzles or as a film from moving distributors, through which it trickles to the underdrain system, coming in contact with the bacterial films adhering to the surface of the stones, and in which such aeration of the bacterial surfaces as may be required to oxidize the sewage is afforded.

—**Filter, High Rate**—An artificial bed of coarse material, such as broken stone, clinkers, slate, slats, or brush, over which sewage is distributed and applied in drops, films or spray, from troughs or dippers, moving distributors, or fixed nozzles, and through which it trickles to the under drains, giving opportunity for organic matter to be oxidized by bio-chemical agencies, and in which the rate of application usually ranges between 18 to 24 million gallons per acre per day. Usually continuous application.

**Tridymite**—A mineral consisting,

like quartz, of silica,  $\text{SiO}_2$ , but differing in crystallization.

**Triglyph**—In architecture, a block applied on the Doric frieze and carved with two full glyphs and two half glyphs. It is the most striking characteristic of the Doric order.\*

**Trim (airplane)**—The attitude with respect to wind axes at which balance occurs in rectilinear flight with free controls.

**Trim (airship)**—The attitude of the longitudinal axis of an airship with respect to the horizontal.

**Trim (seaplane)**—The angle with the horizontal surface of the water assumed by the float or hull under given conditions.

—**Angle**—The angle between the horizontal and the longitudinal base line of a seaplane float or flying-boat hull. It is positive when the bow is higher than the stern.

**Trimming Moment**—The moment about a reference point, usually the center of gravity, exerted by the seaplane hull or float when held at a fixed trim angle. It is considered positive when the bow tends to rise.

**Triple Cancellation**—The arrangement of the web members of a truss having three separate systems of diagonals.

—**Expansion Steam Engine (crank and flywheel)**—A steam end having a high, an intermediate and a low pressure steam cylinder arranged side by side with cranks 120 deg. apart.

—**Steam Engine (direct acting)**—A steam end having a high, an intermediate and a low pressure steam cylinder arranged on the same longitudinal or vertical center line.

—**Stroke or Rod Pump**—A deep well three stroke or triple rod power pump is a reciprocating power driven pump having three sets of pump rods connecting the reciprocating mechanism of the power head with the cylinder

plungers. One line of rod is solid, the second line is hollow and works around the solid line, and the third line is also hollow and works around the other two. All three lines are of equal weight. The cylinder plungers are single acting in type and work one above the other in the same cylinder.

**Triplex Pump**—A power driven reciprocating pump having three pistons or their equivalent single or double acting plungers.

**Tripoli**—This is a leached or chemically deposited bedded sedimentary rock composed principally of chalcedony probably altered from chert or leached from limestone. The material is very siliceous.

**Trolley Rope**—A wire rope used for traveling the carriage of a cableway, ore bridge or similar apparatus.

**Tropic Month**—The month of the moon's declination, approximately  $27\frac{1}{3}$  days in length.

—**Tides**—The tides occurring when the moon in its changing declination is at its maximum semi-monthly declination and is near one of the tropics.

**Truck Agitator**—In the ready-mixed concrete industry, a closed water-tight revolving drum suitably mounted, capable of transporting and discharging concrete without segregation.

—**Mixer**—In the ready-mixed concrete industry, a closed water-tight revolving drum suitably mounted and fitted with adequate blades, capable of combining aggregates, cement and water into a thoroughly mixed and uniform mass of concrete, and of discharging the mixture without segregation.

—**Mixing**—In the ready-mixed concrete industry, the process of combining the aggregates, cement and water into a thoroughly mixed and uniform mass of concrete in a truck mixer.

—**Tractor**—Every motor vehicle de-

signed and used primarily for drawing other vehicles and not so constructed as to carry a load other than a part of the weight of the vehicle and load so drawn.

**True Stress**—A stress as measured by the deformation as it actually occurs.

**Trunk Sewer**—(See main sewer.)

—A sewer which receives many tributary branches and serves as an outlet for a large territory. (A.S.C.E.)

**Truss**—A framed or jointed structure designed to act as a beam while each of its members is primarily subjected to longitudinal stress only.

—**Arch**—A truss having an arched upper chord in compression and a straight bottom chord or tie rod with vertical hangers.

—**Baltimore**—A truss composed of parallel chords and subdivided panels.

—**Bowstring**—A truss in which the lower chord is horizontal and the upper chord joints lie in the arc of a parabola, or similar curve.

—**Bridge**—A bridge made up of chords, columns and web members for carrying the floor system.

—**Burr**—A timber truss with counter-struts inserted throughout the entire length, giving great rigidity.

—**Cantilever**—A truss overhanging its support at one end and anchored down at the other.

—**Depth**—The vertical distance between the center lines of the upper and lower chords.

—**Howe**—A form of truss in which the vertical members of the web take tension and the diagonal members compression.

—**King**—Properly a trussed beam with one vertical post at center.

—**Lattice**—A truss having several web systems.

—**Murphy**—A Whipple truss having eye-bars for the lower chords.

—**Pony**—A low truss without any overhead bracing.

- Pratt**—A type of truss having parallel chords and an arrangement of web members of tension diagonals and compression verticals.
- Spacing**—The perpendicular distance between the central planes of trusses of a bridge.
- Warren**—A form of triangular truss composed of equilateral triangles.
- Whipple**—A double intersection Pratt truss.
- Trussed Cushion Template**—A term used in paving brick operations for a template for striking the cushion course that is braced by means of an overhead simple triangular truss.
- Eye-Bar**—An eye-bar supported by trussing so as to resist compression or bending.
- Tube, Detonator**—(See detonator tube.)
- Dredging**—(See dredging tube.)
- Tubing Lines**—Wire rope used for placing and pulling oil well tubing.
- Tubular Cable**—In electricity, a concentric form of a cable having alternate layers of copper and insulation.
- Tuck**—Inserting the strand in the center of a rope or inserting a strand or wire between other strands or wires in splicing.
- Tuff Breccia**—A stratified tuffaceous rock in which the fragments are angular and larger than in tuff.
- Tufting**—An erosion term for the practice of planting sod in tufts or small bunches.
- Tunnel Lining**—The inner added surface of a tunnel; may be concrete, brick or steel. A bolted metal shell serving either as a permanent inner surface for a tunnel or as a form by which a coating wall of concrete is built.
- Water**—(See water tunnel.)
- Wind**—(See wind tunnel.)
- Turbidimeter**—An instrument which measures the intensity of light passing through a given suspension. Such an instrument is used for measuring the specific surface of cements, inasmuch as the intensity of light passing through a suspension of cement is proportional to the specific surface.
- Turbidity**—A measure of suspended matter in water.
- Turbine Pump**—A single or multi-stage pump having either a circular or volute type casing with removable diffusion vanes.
- Deep Well**—A vertical shaft centrifugal pump with rotating impeller or impellers, suspended from the pump head by a column or eduction pipe which also serves as a support for the shaft and bearings. It is primarily designed for installation in bored wells, but it may also be used in ditches, dug wells, mine shafts, sumps, and many other applications.
- A complete deep well turbine pump of standard design consists of the following items: (a) Head. (b) Lubricating device of whatever type required, when used. (c) Discharge column made up of sections, each section consisting of: (1) outer pipe (also termed outer column, eduction pipe, or drop pipe), (2) shaft enclosing pipe or tubing, when used (also termed inner column, cover pipe, or oil tubing), (3) lineshaft, (4) bearings, (5) couplings, (6) spiders, when used. (d) Bowl assembly (or pumping element). (e) Suction pipe 10 ft. long. (f) Suction strainer.
- Turbo, Rotary and Centrifugal Compressor**—These are machines in which the compressing element rotates.
- Turbulent Flow**—(aeronautic) Any part of a fluid flow in which the velocity at a given point varies more or less rapidly in magnitude and direction with time.
- Velocity**—That velocity above which, in a particular conduit, turbulent flow will always exist, and below which the flow may be either

- turbulent or laminar, depending on circumstances.
- Turf**—Sod or grass; a "stand of grass" is the same, although turf generally is used to describe a heavy "stand."
- Turgite**—An iron ore intermediate between hematite and limonite, consisting of hydrous ferric oxide,  $2\text{Fe}_2\text{O}_3 \cdot \text{H}_2\text{O}$ .
- Turnbuckle**—A right and a left hand screw engaging an elongated central body and having eyes, hooks or jaws formed on the outer ends, for tightening guys and other wire ropes.
- A nut with a right-and-left-hand screw for tightening up rods.
- Turn, Immelman**—(See Immelman turn.)
- Indicator**—An instrument for indicating the existence and approximate magnitude of angular velocity about the normal axis of an aircraft.
- Turn-and-Bank Indicator** — (aeronautic) An instrument combining in one case a turn indicator and a lateral inclinometer.
- Turning Point (T.P.)**—A point on which both a minus sight (foresight) and a plus sight (backsight) are taken on a line of direct levels.
- Turnmeter**—An instrument that measures the rate of turn of an aircraft about any predetermined axis.
- Turnout**—An arrangement of a railroad switch and a frog with closure rails, by means of which rolling stock may be diverted from one track to another.
- Number**—In railroad work, the number corresponding to the frog number of the frog used in the turnout.
- Turnpike**—A roadway whose name originated in the use of a turnstile or a pikestaff on a pivot at a toll-gate.
- Turntable Girder**—A fish-bellied girder that is used in a platform for turning locomotives.
- Tuyere**—A tube or pipe through which air is blown directly into a blast furnace.
- Twist**—Where the fiber or grain of the timber spirals or interwinds, having a tendency to separate the wood fibers.
- Two-Part Commutator**—In electricity, a commutator with two insulated segments.
- Two Phase Motor**—An electric motor that is driven by two phase alternating currents.
- Two-Speed Transmission** — (motor car)—A device applied to any railway motor car drive to change from a faster to a slower movement with an increase of power, which is usually effected through the medium of a jack shaft, power being transmitted to the latter by belt and thence to the drive axle by roller chain and sprockets. It is designed for the purpose of extending the scope of the railway motor car to include that of both the section and the extra gang car, also to enable it to start heavy loads and operate on heavy grades.
- Two-Stage and Multi-Stage Compressor**—When air or gas is compressed from initial intake pressure to final discharge pressure in two distinct steps, the machine is said to be of the two-stage type.
- Dam**—A dam having two distinct drops.
- Tympanum**—In architecture, the triangular portion of a wall above the entablature, in line with the face of the frieze and enclosed by the two sloping and one horizontal cornice of the pediment.\*

# U

**U-Nut**—A piece of iron or steel in the shape of a letter U, through which passes the threaded end of a rod, and which affords a bearing for the nut, with room to screw up the latter. Its use is not permissible in first-class bridge construction.

**Ullage**—The amount which a tank or vessel lacks of being full.

**Ultimate Analysis**—In the case of coal and coke, the determination of carbon and hydrogen in the material, as found in the gaseous products of its complete combustion, the determination of sulfur, nitrogen, and ash in the material as a whole, and the estimation of oxygen by difference.

—**Elongation**—In steel, the ratio of the increase in length of a bar or section ruptured under tension to its original length.

—**Load** (stress analysis)—The load that causes destructive failure in a member during a strength test, or the load that, according to computations, should cause destructive failure in the member.

—**Strength**—That stress, calculated on the maximum value of the force and the original area of cross-section, which causes fracture of the material.

**Ultra Audible Sound**—In acoustics, sound whose frequency is above the upper pitch limit.

**Unakite**—A granite rock consisting essentially of epidote, pink feldspar and quartz.

**Unbalanced Bid**—A bid in which certain unit prices are above a fair price and other unit prices are below a fair price.

—**Cross-Section**—In Portland cement concrete pavement, a section not of a design with the same maxi-

mum values of unit stress at all points.

**Uncontrolled Spin**—(aeronautic) A spin in which the controls are of little or no use in effecting a recovery.

**Uncoursed**—Masonry laid without regard to courses.

**Unctuous**—Having a greasy, oily, or soapy feel when rubbed or touched by the fingers, as talc, serpentine, etc.

**Undercarriage**—(See landing gear.)

**Undercutting**—The cutting away at the base, or underpart, of a steep slope or cliff, as by stream, glacier, wind, or wave erosion, thereby steepening the slope or producing an overhanging cliff.

**Under-Drain**—(See subdrain.)

**Underflow**—Movement of water through a pervious subsurface stratum; the flow of percolating water; of water under ice, or under a structure; the rate of flow or discharge of subsurface water.

**Undergrowth**—Used in roadside development to denote plant life which grows under trees; underbrush; a thicket; grove of small trees.

**Underpass**—An opening under a roadway for the purpose of permitting pedestrians, livestock or other traffic to pass in safety.

—An opening under a railroad or other roadway through which a street or highway passes.

**Underpinning**—The process of bolst'ering up any part of a foundation or substructure that has been or may be undermined.

**Underwriters' Loop**—(See Hartford connection.)

**Undock**—To remove an airship from its dock.

**Undulating**—Rising and falling like waves. Said of beds that are bent

into alternate elevations and depressions.

**Unfaced Surface**—Having surface formed by careful grading of the entire mass mixture and spading mixture to prevent voids leaving the coarse aggregate next to the forms.

**Uniclinal**—Sloping in one direction; a monoclinal.

**Unifilar Winding**—In electricity, that winding which consists of one continuous insulated wire.

**Uniform Flow**—A flow whose velocity is constant. If the flow is also constant, it is referred to as "steady uniform flow."

**Uniperiodic Current**—In electricity, an alternating current having an unvarying frequency.

**Unit Cost**—In engineering economics, the total cost of producing a unit, such as a cubic yard of concrete where cubic yard is the unit.

—**Elastic Resilience**—The elastic resilience of a body per unit length.

—**Interest Cost**—In engineering economics, the total annual interest on a plant investment divided by the total number of units of product. A plant unit is a single machine, or a single structure.

—**Of Time**—The second, 1/86400 of a mean solar day.

—**Price**—The amount of money per single quantity of the various quantities specified in a contract for which a certain work is to be performed.

—**Stress**—The stress per unit of area; the measure of intensity of stress.

**Universal Joint**—In cast iron pipe, a connection in which a partial ball-shaped machined end is bolted into a partial socket-shaped machined end. The pipe needs no caulking, merely draw the bolts up snugly.

—**Motor**—In electricity, a motor operating either on direct or alternating current.

**Unpitched Sound**—In acoustics, any

sound to which no definite pitch can be assigned.

**Unstable Oscillation**—(aeronautic) An oscillation whose amplitude increases continuously until an attitude is reached from which there is no tendency to return toward the original attitude, the motion becoming a steady divergence.

**Unsymmetrical Loading** (stress analysis) — (aeronautic) A design loading condition for the wings and connecting members, representing the conditions as in a roll.

**Untreated Surfaces**—Untreated road surfaces are those which consist of mineral aggregates held together by the binding, compacting, or interlocking qualities of the materials themselves or by the addition of mineral binder such as clay.

**Uplift**—The aggregate pressure on the base of a structure due to the head of water on the foundations.

—The tendency of a structure to rise from its support, due to special loading conditions or to the buoyancy of high water.

**Upper-Surface Aileron**—(aeronautic) A split flap forming the rear upper surface of a wing, deflected for lateral control.

**Upset End**—The end of a metal rod which is increased in cross-sectional area to offset the reduction in area caused by threading or making a hole for a pin.

**Upward Reaction**—A reaction having an upward direction. This is generally the same as "positive reaction."

**Useful Lift** (aerostat)—The lift available for carrying passengers, fuel, oil, supplies, cargo, etc. It is the difference between the gross lift and the fixed weight of an aerostat.

—**Load**—(aeronautic) The crew and passengers, oil and fuel, ballast other than emergency, ordnance, and portable equipment.

# V

**v-Point**—See Nadir.

**Vacuum Back**—(aerial photography)

A perforated metal plate used in some film cameras or transformers in connection with a Venturi tube or suction pump in order to make the film lie flat.

—**Final**—Practical removal of air from a chamber as the final operation in a wood treating process; used to aid in the removal of surplus preservative injected and in drying the timber.

—**Initial**—Vacuum sometimes applied as the first step in the treating operation for the purpose of removing air from the wood cells.

—**Preliminary**—Vacuum applied to wood before injecting the preservative in pressure treatment.

—**Pump**—A machine designed for reducing atmospheric pressure in closed containers.

**Vadose**—Extending only a short depth below the surface; said of the shallow portion of the ground water.

—**Water**—(See suspended subsurface water.)

**Valley Train**—A deposit of glacial outwash forming an old flood plain in a valley.

**Valuation**—The process of estimating value.

—**Order No. 3**—An order of the Interstate Commerce Commission to enable it to comply with the provisions of paragraph (f), Section 19a of the Interstate Commerce Act. It prescribes a uniform system for recording and reporting changes in the physical property of every common carrier subject to the act to regulate commerce.

—**Records**—Records of a nature to show the money value of the component parts of railroad or other property and evidence of methods

and data used in determining such costs and value.

—**Tentative**—(See tentative valuation.)

**Valuator**—One who values property; an appraiser.

**Value, Actual**—Real, cash or true value. Not a precise term. In common usage it means real value as distinguished from a property value taken from books or records.

—**Appraised**—An amount representing value in the opinion of an appraiser.

—**Attached Business**—In appraising, an amount representing the worth of a business of a developed enterprise, exclusive of fixed tangible assets, working capital and investments, and may include organization, records, customers, special rights, privileges, and good will. Such value may be predicted on cost or earning power.

—**Book**—In appraising, an amount representing worth of specific assets, or the net worth of the business, as shown in the books. It may have no relation to value in the economic sense.

—**Capitalized**—In appraising, value computed by the "capitalization" of an assured or anticipated income, or benefit which may be measured in terms of income; the capital sum upon which an assured or anticipated income, royalty or benefit will yield a reasonable return, and in addition provide for the amortization of the original capital sum over the period the income, royalty or benefit is expected to continue.

—**Cash**—The amount that might reasonably be realized as the result of an immediate sale for cash or its equivalent.

—**Fair**—In appraising, strictly a val-

ue that is fair to all parties under the existing or assumed circumstances. "Fair value" in a limited usage signifies the "base" upon which service rates and charges, and resulting earnings, may be predicated or analyzed, and is thus used in connection with public utility rate regulation.

**Value, Forced Sale**—The price that could be obtained at immediate disposal; a modification of liquidation value.

—**For Use**—In appraising, an amount at which ownership is justified assuming a specific use for the property. It may be "sound value," "market value," or other basis adjusted by giving recognition to conditions affecting the actual or prospective use of the property.

—**Good Will**—In appraising, broadly, the advantage in custom which a business has acquired beyond the mere value of what it sells; specifically, the assets created in a going enterprise through advantage of location, name, patents, trademarks or benefits; commercially the value reflected in the proven ability to produce a net return above the normal amount required to satisfy the capital invested.

—**Intrinsic**—In appraising, the value in a true economic sense reflecting the desirability for use, in distinction from a value inconsistent with the utility of the asset.

—**Leasehold**—In appraising, the value of the lessee's interest in a property held under lease or tenure. Usually represented by the present worth of the savings in rentals under the terms of an agreement in comparison with normal rentals or the cost of ownership in fee over the remaining period of the lease.

—**Ledger**—(See ledger value.)

—**Market**—In appraising, the amount expressed in terms of money which a purchaser would be justified in paying and a seller justified in ac-

cepting for a property as of a certain date.

—**Market Price**—In appraising, the amount at which a property might actually be transferred between a buyer and seller under the particular conditions existing at the time, and which "price" might not be the equivalent of the then market value.

—**Prudent**—In appraising, a term developed in court procedure relating to public utility rate making practice and presumably meaning the "sum which might be prudently or wisely invested in a purchase of a public utility enterprise as of any date."

—**Realization** — In appraising, an amount that may reasonably be expected to be realized from a property, predicated from its sale or exploitation, after deducting all expenses incident to the completion of the transaction.

—**Re-use**—In appraising, the amount that represents worth for use for some other purpose or in some other location.

—**Salvage**—In appraising an amount that might reasonably be realized from dismantlement and sale.

—**Scrap**—In appraising, an amount that might be realized from property broken into materials and sold as junk.

**Valve**—(aeronautic) To release air or supporting gas from an aerostat into the atmosphere.

—**Air Relief**—A small valve placed at the summit of pipe lines for the purpose of letting out the air automatically and preventing the pipe line from becoming air-bound with a resultant increase of pressure.

—**Hood**—The appliance, having the form of a hood or parasol, which protects the valve of an airship or balloon against rain; also called "valve cover" or "bonnet."

—**Petticoat**—(aeronautic) A special sleeve between the valve and gas

container making it possible to tie off the sleeve and change valves without loss of gas.

—**Seal**—A fabric cover used to seal the automatic valves of a rigid airship while it is docked.

**Vane-Type Supercharger**—A positive-displacement rotary blower having an eccentrically located rotor provided with one or more vanes.

**Vanner**—A machine for dressing ore by means of a shaking motion and a current of water.

**Variable Condenser**—In electricity, that condenser the capacity of which varies between prescribed limits.

**Variation**—Periodic or irregular changes in the declination of the magnetic needle, the chief of which are known, respectively, as secular, daily, annual, and irregular. The term is used by navigators to denote Declination; it is also so used in the State of Texas.

**Varnish**—A liquid coating material, containing no pigment, which flows out to a smooth coat when applied and dries to a smooth, glossy, relatively hard, permanent solid when exposed in a thin film to the air.

**Varve Clay**—Alternating dark and light bands or layers in a fresh-water clay deposit. Each pair, or varve, represents one year's accumulation, the lighter, thicker, and coarser layer being laid in the summer and the darker, thinner, and finer-textured layer in the winter.

**Vault**—In architecture, an arched ceiling.\*

**Vegetation**—Used in roadside development to denote the cultivated and natural vegetative growth, and all plant life found adjacent to the roadside.

**Vehicle**—In traffic administration, every device in, upon, or by which any person or property is or may be transported or drawn upon a highway, except devices moved by human power or used exclusively

upon stationary rails or tracks.

—In painting, the liquid portion of a paint.

**Vein**—(sheet) In geology, a term referring to material occupying bedding planes between the strata.

—**Minerals**—The minerals occurring in veins, especially the gangue.

—**Quartz**—In petrology, a rock of pegmatitic or hydrothermal origin consisting essentially of interlocking sutured crystals of quartz, the individuals varying widely in size. It is of secondary origin and occurs in veins.

**Veins**—In geology, filled fissures.

**Velocity**—Rate of movement in relation to time.

—**Head** (symbol  $H_v$ ) — Velocity head of water moving at a given velocity is the equivalent head through which it would have to fall to acquire the same velocity. It is expressed by the formula

$$H_v = \frac{V^2}{2g}$$

—in which  $g$  is the acceleration due to gravity or 32.174 feet per second and  $V$  is the velocity in feet per second.

The velocity head is to be figured from the measured rate of pumpage and the measured area of the suction and discharge flanges at the point of gauge connection.

—For a given velocity, the distance a body must fall under the force of gravity to acquire that velocity. The kinetic energy of flowing water is proportional to the velocity head.

—In air conditioning, denotes the pressure—usually measured in inches of water—necessary to create a corresponding air velocity without considering the effects of friction.

—**Level**—In acoustics, the velocity level, in bels, of a sound is two times the logarithm to the base ten of the ratio of the particle velocity of the sound to the reference particle velocity. Unless otherwise

specified, the reference particle velocity is understood to be 5 times  $10^{-4}$  centimeters per second effective value. Velocity level may also be expressed in decibels.

—**Of Approach**—The mean velocity of water approaching a structure. It has a particular significance for weirs, orifices, and other measuring devices, wherein the velocity of approach must be taken into account.

—**Of Recession (Retreat)**—The mean velocity of the water as it leaves a structure.

—**Permissible**—(See permissible velocity.)

—**Terminal**—The hypothetical maximum speed that an airplane could attain along a specified straight flight path under given conditions of weight and propeller operation, if diving an unlimited distance in air of specified uniform density. If the term is not qualified, a vertical path angle, normal gross weight, zero thrust, and standard sea-level air density are assumed.

**Vena Contracta**—The most contracted section area of a stream, jet, or nappe, beyond the plane of the orifice, or notch, through which it issues. The contracted vein.

**Venturi Flume**—A type of open flume with a contracted throat that causes a drop in the hydraulic grade line; used for measuring flow.

—**Flume, Improved**—(See Parshall measuring flume.)

—**Meter**—A water meter in which the flow is ascertained from the increase in velocity and consequent loss of pressure caused by the reduction in the cross-sectional area of the pipe through which the water flows.

—(In hydraulics) A closed conduit in which a gradual contraction is placed, which causes a reduction of pressure head by which the velocity may be determined. The contraction is generally followed,

but not necessarily so, by an enlargement to the original size. The section of smallest area is called the throat; the approach to the throat, the contracting section; and the recess from the throat, the expanding section (if it exists). Named after G. B. Venturi.

—**Tube**—(aerial photography) A device utilizing moving air currents to produce a partial vacuum in a film camera that is equipped with a vacuum back.

—**Tube**—A closed conduit which is gradually contracted to a throat, causing a reduction of pressure head by which the velocity through the throat may be determined.

**Venus's Hair-stone**—Quartz containing included acicular crystals of rutile.

**Verde Antique**—A dark-green rock composed essentially of serpentine. Usually crisscrossed with white veinlets of magnesium and calcium carbonate.

**Vermiculated**—In architecture, an ornamental treatment applied to stone, that represents the path of worms.\*

**Vertex (of Curve)**—See Point of Intersection.

**Vertical**—An upright member in a truss.

—(aerial photographic mapping) A vertical line through the exposure station, or rear nodal point.

—**Compressor**—A machine which has the compressing element in a vertical position.

—**Curve**—In roadbuilding, a curve in a profile of a highway.

—**Fiber** (lug paving brick)—Brick with projections on one side and usually on both ends to provide positive separation of joints when laid in the pavement.

—**Fiber** (lugless paving brick)—Brick without projections on the sides or ends.

—**Fiber** (paving brick)—A wire cut paving brick that is laid in the pavement with the wire cut surface

used by traffic. For standard size brick this means that the brick are laid flatwise.

**Vertical Flow Tank**—A sedimentation tank in which the sewage enters near the bottom, rises vertically, and flows out at the top.

—**Hip**—(See hip vertical.)

—**Illumination**—The illumination of a microscopic specimen by reflected light.

—**Lift Bridge**—A bridge having a span that hoists vertically.

—**Pump**—(submerged type) A centrifugal pump in which the impeller shaft is vertical and which is located in a wet well.

—**Pump**—(suction type) A centrifugal pump of which the impeller shaft is vertical and which is located in a dry well.

—**Split Head**—A split along or near middle of the head of a railroad rail and extending into or through it. A crack or rust streak may show under the head close to the web, or pieces may be split off the side of the head.

—**Strut**—A vertical compression member.

—**Tail Area**—(aeronautic) The area of the actual outline of the rudder and the fin projected in the vertical plane, the fairings and fillets being ignored.

—**Velocity Curve**—(hydraulics) A graph of the relation between depth and velocity along a vertical line in a stream, as determined by a set of observations.

**Vesicle**—A small cavity in an aphanitic or glassy igneous rock formed by the expansion of a bubble of gas or steam during the solidification of the rock.

**Vesicular**—(rock) Rock which contains cavities produced by the expansion of gases during the consolidation period.

**Vestibule**—A small entrance room to a larger apartment.\*

**Viaduct**—An extended bridge of

many spans, mainly over dry ground.

**Vibrating Screen**—A form of sizing apparatus in which vibrating, gyrating or pulsating action is applied to the screening surface.

**Vibration**—A movement back and forth. A form of motion in which the moving particle occupies successive positions in recurrence.

—**Forced**—(See forced vibration.)

—**Free**—(See free vibration.)

**Vine**—A plant that will not grow upright unless supported, and which grows long branches.

**Virgin Forest**—Applies to mature or overmature forest grown entirely uninfluenced by human activity.

—**Soil**—Soil that has not been disturbed, at least over a long period of years.

**Viscosimeter**—An instrument used to measure the viscosity of liquids.

**Viscosity**—All liquids possess a definite resistance to change of form and many solids show a gradual yielding to forces tending to change their form. This property is called viscosity; it is expressed in dyne-seconds per cm<sup>2</sup> or poises. The resistance of a liquid to free flow.

—(of bitumens)—The measure of the resistance to flow of a bituminous material, usually stated as the time of flow of a given amount of the material through a given orifice.

**Viscous**—Adhesive or sticky, and having a ropy or glutinous consistency.

**Visibility**—The greatest distance at which conspicuous objects can be seen and identified.

**Vista**—A view or prospect, commonly along or through an avenue, as between rows of trees in cities or between varying groups of trees in the country.

**Vitreous**—Having the luster of broken glass, quartz, calcite, etc.

**Vitrification**—The consolidation of material under high heat.

- Vitrified**—(brick) The term vitrified is applied to brick that has been burned to a point of incipient fusion and that will have the physical qualities of a paving brick.
- Vitrite**—In electricity, a hard glass used for insulators.
- Voids**—The spaces between particles of a substance or mixture.
- Ratio**—In soil technology, the ratio of the volume of voids to the volume of soil particles in a soil mass; i. e., the volume of the voids or pores per unit volume of soil particles in a soil mass.
- Volatile**—Applied to those fractions of bituminous materials which will evaporate at climatic temperatures.
- Matter**—(coal and coke) Those products, exclusive of moisture, given off by a material as gas or vapor, determined by definite prescribed methods which may vary according to the nature of the material.
- Thinner**—All that liquid portion of a paint, water excepted, which is volatile in a current of steam at atmospheric pressure.
- Volcanic Glass**—A volcanic igneous rock of vitreous or glassy texture, such as obsidian, pitchstone, and tachylyte.
- Neck**—The filled-up vent or pipe of a former volcano.
- Tuff**—A tuff is a rock composed of the finer fragmental, consolidated ejecta from the explosive eruptions of a volcano. When a volcano erupts in this manner the surrounding rocks are shattered and hurled into the air along with the magma. The consolidation of the finer particles of this material forms the tuff. The color may be white, pink, brown, gray or yellow, sometimes passing into the darker shades.
- Voltage, Breakdown**—(See breakdown voltage.)
- Charger**—In electricity, any device which serves to lower or raise a voltage.
- Inverse**—(See inverse voltage.)
- Voltite**—In electricity, a commercial preparation used for insulating wires.
- Volume**—A dimension of unit being equal to a length  $\times$  a breadth  $\times$  a thickness.
- Aerodynamic**—(See aerodynamic volume.)
- Gas** (airship)—The volume of the contained gas (cf. capacity).
- Resistance**—In electricity, that resistance offered by a conductor's material to the passage of current.
- Volumetric Efficiency**—(of compressor) The ratio of the capacity of the compressor to displacement.
- Change**—(soil technology) For a given moisture content is the volume-change, expressed as a percentage of the dry volume, suffered by the soil mass when the moisture content is reduced from the stipulated percentage to the shrinkage limit. This stipulated moisture content is usually taken as the field moisture equivalent.
- Volunteer Growth**—Trees, shrubs and vines or other woody vegetation which has come up on an area through seed produced by nearby plants and transported by wind or other natural carriers.
- Volute**—In architecture, the spiral scroll occurring in the capitals of the Ionic, Corinthian, and Composite orders.\*
- Centrifugal**—(See centrifugal volute pump.)
- Pump**—A pump having a casing made in the form of a spiral or volute.
- Voucher**—A record of payment that indicates in detail and by proof the entire history of the transaction.
- Vousoir**—An arch stone.
- Vug**—A cavity in the rock, usually lined with a crystalline incrustation.

**Vulcabeston**—In electricity, an insulating material composed mainly of rubber and asbestos.

**Vulcan Powder**—An explosive mix-

ture composed of 30 per cent nitroglycerin, 52.5 per cent sodium nitrate, 10.5 per cent charcoal, and 7 per cent sulphur.

# W

**Wacke**—Residual sand and clay formed by the decay of diabase, basalt, basaltic tuff, and similar rocks.

**Wad**—Bog manganese. An impure mixture of manganese and other oxides. It contains 10 to 20 per cent of water, and is generally soft.

**Wages**—The term is defined to mean all remuneration for employment, including the cash value of all remuneration paid in any other medium than cash. It includes, in addition to money payments, payments in kind, rent, food, lodging, etc. (at fair market value). It includes also commission, fees, bonuses, millwork rates, profit-sharing, and in some cases tips. Concerning wages, the Bureau of Internal Revenue in Regulations 90 declares that: "The name by which remuneration is designated is immaterial; likewise the basis upon which payable and the time of payment—whether piecework or a percentage of profits, whether payable hourly, daily, weekly, monthly or annually. Ordinarily, facilities or privileges (such as entertainment, restaurants, medical service, 'courtesy' discounts on purchases) furnished or offered by an employer to his employees generally, are not considered as remuneration if offered merely as a convenience to employer or a means of promoting health, good will, content or efficiency of employees."

**Wagon Drill**—A reciprocating drill operated by steam or compressed air. It is similar to a tripod drill, but is mounted on a truck and employs long steel which does not require frequent change.

**Wakefield Piling**—Three wide boards or planks so nailed together that the center is offset to form a

tongue and groove. When driven the tongue of one pile rides in the groove of the adjacent pile.



*Photo courtesy Worthington Pump and Machinery Corporation*

## *Wagon drill*

**Waling Piece**—A timber on the water side of a pier, wharf or quay to prevent damage to the mainland structure by a vessel.

—Timber used as a guide or brace in construction work.

**Walkway Girder**—A girder supporting a walkway along the keel or other part of a rigid or semi-rigid airship.

**Wall**—Breast Wall—The front wall of an abutment between bridge seat and footing.

—Retaining Wall—A wall built to sustain a lateral pressure, such as earth pressure.

—Revetment Wall—A wall constructed along the toe of an em-

- bankment slope to protect the same against erosion.
- Wing Wall**—An abutment extension, intended to hold back the embankment.
  - Beam**—A reinforced concrete beam which extends from column to column along the outer edge of a wall panel.
  - Plate**—A steel plate laid on a masonry or a concrete wall to carry the end of a beam and to distribute its load.
  - Rock**—In geology, the rock forming the walls of a vein or lode; the country rock.
  - Wane**—Bark, or the lack of wood or bark, from any cause, on the edge or corner of a piece of lumber.
  - Warp**—Any variation from a true plane surface. It includes bow, crook, cup, or any combination thereof; a twist.
  - (aeronautic) To change the form of a wing by twisting it. Warping was formerly used to perform the function now performed by ailerons.
  - Warren Girder**—A latticed triangular girder in which all the triangles are equilateral. Nowadays any triangular girder is spoken of as a Warren girder.
  - Wash**—The dry bed of an intermittent stream, sometimes at the bottom of a canyon.
  - (aeronautic) The disturbance in the air produced by the passage of an airfoil. Also called the "wake" in the general case for any solid body.
  - Washer**—Wide annular metal ring placed under a nut to increase bearing area or to hold the nut in position. (See lock washer, and ogee washer.)
  - Ogee**—A circular piece of cast iron with a hole to receive a bolt or large lag screw, the outer edge surface of which has an ogee shape.
  - Spring**—A circular piece of steel designed to prevent backward movement of the nut and looseness in the bolted members of a joint due to wear, stretch, rust or other deterioration.
  - Washin**—A warp of an airplane wing giving an increase of the angle of attack toward the tip.
  - Washout**—An erosion of the permanent roadbed by storm or flood to such an extent as would delay or endanger traffic.
  - A warp of an airplane wing giving a decrease of the angle of attack toward the tip.
  - Waste**—Material from excavation not used in the construction.
  - Lime**—Any industrial waste or by-product containing calcium or calcium and magnesium in forms that will neutralize acids. (See fine lime.)
  - Weir**—A spillway.
  - Wastes, Industrial**—(See industrial wastes.)
  - Wasteway**—(hydraulics) The channel required to convey water discharged into it from a spillway, escape or sluice; a spillway.
  - Water Cooled Compressor**—A machine in which the compressor cylinder is cooled by the circulation of water through jacket spaces adjacent to the cylinder.
  - Column**—In railway use, a mechanical device consisting of valve, vertical pipe and spout, through which water is controlled and delivered to a locomotive tender.
  - Cost**—The quantity of water used for any particular purpose; for example, the water cost of plant growth is expressed by the transpiration ratio. Water demand is a better term.
  - Cushion**—(hydraulics) A pool of water maintained to break the impact of water overflowing a dam, chute, or other spillway structure.
  - Film**—(1) The film of water surrounding and held by a soil particle; (2) any thin layer of water.
  - Gain**—A term applied to the accumulation in the upper portions

of a layer of concrete which is under construction.

**Water Gap**—A pass in a mountain ridge through which a stream runs.

—**Gas Tar**—Tar produced by cracking oil vapors at high temperatures in the manufacture of carburetted water-gas.

—**Glass**—A glassy or stony substance consisting of silicates of sodium or potassium, or both, soluble in water, forming a viscous liquid.

—**Ground**—(See ground water.)

—**Hammer**—Excess pressure or other reactions due to sudden decreases in the velocity of water flowing through a pipe line, such as closing a valve quickly or the pulsations of a pump.

—**Level Recorder**—A device for producing a graphic record of the rise and fall of water with respect to time.

—**Lime**—Hydraulic lime; a Silurian limestone formation overlaying the Salina proper of New York. Hydraulic lime is made from it.

—**Logging**—Over-irrigation of lands until the ground-water rises to a level detrimental to plant growth.

—**Of Imbibition**—The proportionate amount of water that a rock can contain above the line of water level or saturation.

—**Pocket**—In railroad use, a depression in the roadbed, filled with ballast or other porous material, wherein water collects and is confined.

—**Power**—The energy created by water passing from a higher to a lower level. It may be either developed or undeveloped.

—**Power Plant**—Structures, plants and other related facilities essential in connection with the utilization of water power.

—**Power Rights**—A property consisting of the holding of the rights to the use of water for power, developed or undeveloped.

—**Quantity**—Methods of water measurement are divided into primary

and secondary methods according to whether the method is in itself an absolute measurement or quantity or merely the measurement of an effect of quantity or rate of flow. Of these methods the only primary methods are those of measurement by volume or weight. Secondary methods are more generally used in practice. These are measurements by weir, venturi meter, nozzle, pitot tube, etc.

—**Recovery**—The process and the equipment used on an airship for condensing and recovering the water contained in the exhaust gases of internal-combustion engines, in order to avoid the valving of gas as the fuel is consumed.

—**Requirement**—The total quantity of water, regardless of its source, required by crops for their normal growth under field conditions.

—**Right**—A legal right to the use of water.

—**Rights**—A property consisting of the holding of the rights to use water for any purpose.

—**Stage Register**—A device for registering the water level in streams or other bodies of water.

—**Surface**—(See surface water.)

—**Table**—The upper limit of the portion of the ground wholly saturated with water.

—**Tank Indicator**—(See indicator, water tank.)

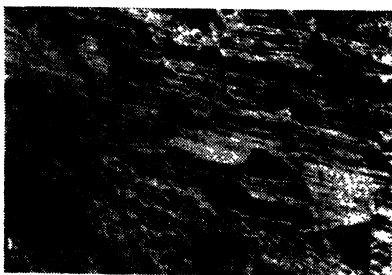
—**Tunnel** (aeronautic) — A device similar to a wind tunnel, but using water as the working fluid.

—**Volume**—The standard unit for volume is the U. S. gallon or the cubic foot. The gallon unit is expressed in gallons per minute (gpm.) or million gallons per day of 24 hours (mgd.). The cubic-foot unit is expressed in cubic feet per second. The standard U. S. gallon contains 231 cu. in. For temperatures not exceeding 85 deg. Fahr., the specific gravity of water may be taken as unity. (At 85 deg. the specific

- gravity equals 0.9958 exactly.) Where exact computations are desired, the table showing change of the specific gravity of water with temperature is used.
- Water-Bound**—Bound or bonded with the aid of water.
- Water-Break**—An arrangement in a ditch or ravine to reduce wash.
- Waterbound Macadam**—A type of highway pavement consisting essentially of fragments of crushed stone or slag compacted so that they interlock and are bound by means of stone or slag dust and water.
- Waterproofing**—The treatment of any material or structure to prevent the entrance or passage of water or other liquid under head.
- Integral**—The process by which any admixture other than usual ingredients is added to a material in the process of manufacture for the purpose of increasing the water-tightness of the product.
- Membrane**—The application of alternate layers of fabric or felt, and bitumen to form a covering on a surface for the purpose of preventing the entrance of water or other liquid under head.
- Metallic**—The application to a surface of a mixture of a metal and a reagent, the chemical reactions of which tend to fill the pores.
- Plaster Coat**—The surface application of one or more coats of impervious material in the form of plaster to prevent the entrance of water.
- Pressure**—The process by which a material is forced into the pores or cracks or to the exterior or pressure side of a structure for the purpose of making it watertight.
- Watershed**—The region or area contributing to the supply of a river or lake; drainage area, catchment area, drainage basin.
- Waterway**—A channel, either natural or artificial, for conducting the flow of water.
- Waterways, Navigable, Artificial or Natural**—(See navigable waterways.)
- Water-Year**—A special grouping of the periods of a year to facilitate water supply studies. The U. S. Geological Survey uses October 1 to September 30.
- Watt**—A standard unit of electrical energy. It is the rate of doing work when an ampere passes through an ohm, and it is equal to 107 ergs per second, or a Joule per second (1/746 of a H.P.).
- Wattles**—Bundles of brush or woody plant stems used in erosion control work, usually in ditches dug along the contours of steep slopes.
- Wave Filter, Low Pass**—(See low pass wave filter.)
- Standing**—(See stationary or standing waves.)
- Stationary**—(See stationary waves.)
- Wash**—(levee) Erosion caused by waves due to high winds across large areas of water during flood periods.
- Wave-length**—In acoustics, the wave-length of a periodic wave in an isotropic medium is the perpendicular distance between two wave fronts in which the displacements have a phase difference of one complete cycle.
- Way Bill**—A document containing a list of goods shipped by a railroad or other freight carrier, with descriptions and shipping instructions for the use and guidance, mostly, of the carrier itself.
- Waylite**—A trade name for slag granulated by a special process.
- Weak Sewage**—A relative term. Sewage containing a relatively small amount of organic matter.
- Wearing Coat**—The superficial layer of the crust or pavement exposed to traffic.
- Course**—The course of the crust or pavement exposed to traffic.
- Surface**—That part of the highway structure which comes directly in

contact with and receives the wear of the traffic. Example: A 6 in. to 10 in. depth monolithic concrete slab is the wearing-surface of the highway when its surface receives directly the wear of the traffic; when macadam is covered with bituminous material which is subjected to the wear of the traffic, then the bituminous material is the wearing surface and the macadam is the base.

**Weathering**—The group of processes, such as the chemical action of air and rain water and of plants and bacteria and the mechanical action of changes of temperature, whereby rocks on exposure to the weather change in character, decay, and finally crumble into soil.



*Differential weathering in a lime-stone bed*

**Web**—The portion of a truss or girder between and connecting the flanges, its function being principally to resist shear.

—**Members**—The parts or sections forming the web of a truss.

—**Stress**—Any stress in a web member of a truss.

**Webs**—In the case of hollow tile, the partitions dividing it into cells.

**Wedge Bearing Draw**—A swing span in which the live load, or a portion thereof, is carried by wedges under the chords of the trusses.

**Weed Burner**—A machine for burning weeds from a railroad or highway track and roadbed shoulder. A flame type burner consists of a

fuel tank, a blower which furnishes the blast for the burner, and the burner itself, usually of the atomizing type, using either distillate or kerosene, and a hood designed to protect the flame from the wind and deflect it to the roadbed. Superheated steam, on railroad work, drawn from a locomotive and applied close to the ground by means of perforated pipes, also performs a duty similar to that of a weed burner.

—**Destroyer**—A railway device for cutting or mowing, or a gas or liquid for burning or poisoning weeds growing on the roadway. Discing and mowing machines are available as separate units or may be attached to a railway motor car, while the burning and poisoning are usually done by special equipment moving as a train over the railroad.

**Weep Holes**—Openings left through retaining walls, aprons, linings, foundations, etc., to permit drainage and reduce pressure.

**Weight, Combining**—(See combining weight.)

—**Theoretical** — (See theoretical weight.)

**Weir**—A structure used to determine the flow of water from measurements of its depth on a crest or sill of known length and form.

—A dam across a stream for diverting flow.

—An opening in the breast of a dam or an embankment to discharge the excess of water.

—**Head**—The distance from the crest of a weir to the water surface in the pool above the weir. It does not include the velocity of approach.

—**Notch**—The opening in a weir for the passage of water.

—**Rectangular** — (See rectangular weir.)

**Weld**—A localized consolidation of metals.

—**Angle Butt**—A butt weld made by

the resistance butt welding process wherein the parts are welded at an angle.

**Weld, Automatic**—A weld made by the aid of automatic equipment.

—**Butt**—A generic form of weld whose throat lies in a plane disposed approximately ninety degrees with respect to the surfaces of at least one of the parts joined. Welded along a seam that is not scarfed or lapped.

—**Caulk**—A weld intended to seal a joint.

—**Composite**—A weld complying with the requirements for both strength and caulk welds.

—**Continuous**—A weld of unbroken continuity.

—**Concave**—In welding, a term applied to a fusion butt weld when its throat thickness is less than the thickness of the thinner part joined, and to a fillet weld when its throat thickness is less than the thickness of the throat of a standard fillet weld.

—**Edge**—A generic form of weld whose throat lies in a plane disposed approximately in the same plane as the surfaces of the parts joined.

—**Fillet**—A generic form of fusion weld of approximately triangular cross section and whose throat lies in a plane disposed approximately forty-five degrees with respect to the surfaces of the parts joined.

—**Finished**—A weld, the natural exposed surface of which has been modified by mechanical or thermal means to improve its appearance.

—**Flat**—A butt or fillet weld made by the fusion welding process with its linear direction horizontal or inclined at an angle of 45 deg. or less to the horizontal, the weld being made from the upper or top side of the parts joined.

—**Flush**—In welding, a term applied to the exposed surfaces of fusion butt welds when the surface of the

weld is even with at least one of the surfaces of the base metal parts joined.

**Weld, Form of**—Weld classification based on the arrangement and cross sectional shape of its component base metal parts, irrespective of the type or form of joint in which it is incorporated.

—**Full Automatic**—A weld made entirely by automatic equipment.

—**Full Fillet**—A standard fillet weld used in the gas and arc welding process having legs equal to the thickness of the thinner section joined.

—**Horizontal**—A bead or a butt weld made by the fusion welding process with its linear direction horizontal or inclined at an angle less than 45 deg. to the horizontal, the parts welded being vertically or approximately vertically disposed.

—**Intermittent**—A weld of broken continuity.

—**Jump Butt**—A butt weld made by the resistance butt welding process wherein a rod, tube, strip, etc., of small cross section is welded at right angles to a relatively larger part.

—**Lap Spot**—A spot weld made by the resistance spot welding process wherein a lap joint is used.

—**Length**—A dimensional expression of the unbroken length of the weld. The length of a gas or arc weld is the length of the full cross section of the weld, exclusive of the length of any craters.

—**Manual**—A weld made by an operator unaided by mechanically guided welding tools.

—**Metal**—The material composing the weld.

—**Overhead**—A butt or fillet weld made by the fusion welding process with its linear direction horizontal or inclined to an angle less than 45 deg. to the horizontal, the weld being made from the lower or under side of the parts joined.

—**Penetration**—A dimensional ex-

pression of the depth of the fusion zone below the original surface and/or edge planes of the base metal.

**Weld, Reinforced**—In welding, a term applied to a weld provided with reinforcement.

—**Ripple**—A gas or arc weld having a surface similar to that produced by dropping a stone in still water.

—**Semi-automatic**—A weld made partially by automatic equipment and partially by manual means.

—**Size**—A dimensional expression of the cross section designed value of the weld. The size of a fillet weld made by the gas and arc welding processes is the designed length of its legs, and the size of a butt weld, made by the gas and arc welding processes, is its net or unreinforced throat dimension in inches.

—**Standard Fillet**—A fillet weld used in the gas and arc welding processes having a cross sectional shape of a right isosceles triangle.

—**Strength**—A weld intended to develop a predetermined strength.

—**Tack**—An intermittent weld used for assembly purposes only.

—**Vertical**—A butt or fillet weld made by the fusion welding process with its linear direction vertical or inclined at an angle less than 45 deg. to the vertical.

**Welding, Arc**—A fusion welding process wherein the welding heat is obtained from an electric arc formed either between the base metal and an electrode, or between two electrodes, with or without the use of gases.

—**Blacksmith**—A forge welding process which utilizes manual hammering.

—**Bronze**—A trade term for the application of bronze or brass to base metal of a higher melting point in essentially the same manner as in fusion welding.

—**Carbon Arc**—An arc welding process wherein a carbon electrode is

used and filler metal, if required, is supplied by a welding rod as in gas welding.

**Welding, Flame, Carbonizing**—(See carbonizing flame.)

—**Flame, Neutral**—(See neutral flame.)

—**Flame, Oxidizing**—(See oxidizing flame.)

—**Flash Butt**—A resistance butt welding process wherein the weld is quickly made by a light contact pressure followed by a period of arcing with no pressure applied and finished with heavy pressure, some of the liquefied metal being thrown out in the form of a flash.

—**Forge**—A process of welding metals in the plastic state by means of manual or mechanical hammering. This process includes blacksmith welding, hammer welding, and roll welding.

—**Fusion**—A process of welding metals in the molten, or molten and vaporous state without the application of mechanical pressure or blows. This process includes gas, arc and fusion thermit welding.

—**Fusion Thermit**—A fusion welding process wherein the welding heat is obtained from liquid steel produced by a thermit reaction, and the filler metal is supplied by the steel produced in this reaction.

—**Gas**—A fusion welding process wherein the welding heat is obtained from a gas flame, oxygen and acetylene being understood to be the gases used unless otherwise stated.

—**Hammer**—A forge welding process which utilizes mechanical hammering.

—**Metal Arc**—An arc welding process wherein the electrode used is a metal rod or wire, which, when melted by the arc, supplies the filler metal in the weld.

—**Percussive**—A resistance welding process wherein the electric current is suddenly discharged across the contact area or areas to be

welded and a hammer blow is applied simultaneously or immediately following the electrical discharge.

**Welding, Pressure**—A process of welding metals in the highly plastic and/or molten states by means of mechanical pressure. This process includes resistance and pressure thermit welding.

—**Pressure Thermit**—A pressure welding process wherein the welding heat is obtained from the liquid products of a thermit reaction.

—**Resistance**—A pressure welding process wherein the welding heat is obtained by passing an electric current across the resistance set up between the contact areas to be welded.

—**Resistance Butt**—A resistance welding process wherein a butt joint is employed.

—**Roll**—A forge welding process which utilizes mechanically operated pressure rolls.

—**Seam**—A resistance welding process wherein the weld is made linearly between two contact rollers, a contact roller and a contact bar, on contact points.

—**Shielded Carbon Arc**—A carbon arc welding process wherein the arc is surrounded by and the molten weld metal bathed in hydrogen or other suitable gases.

—**Shielded Metal Arc**—A metal arc welding process wherein the arc is surrounded by, and the molten weld metal bathed in hydrogen or other suitable gases.

—**Spot**—A resistance welding process wherein the weld is made in one or more spots by the localization of the electric current between contact points.

**Welding Rod**—Filler metal, in wire or rod form, used in the gas and those arc welding processes wherein the electrode does not furnish the filler metal.

**Well (or sump)**—A cistern or well

into which water may be conducted by ditches to drain other portions of a piece of work.

—**Artesian**—A well in which the water level is raised above the normal ground water level by subterranean pressure.

—**Casing**—The pipe forming the wall of a drilled or driven well.

—**Flowing**—An artesian well in which the water rises above the surface of the ground.

—(petroleum)—(See flowing well.)

—**Gravel Wall**—A well provided with a double casing from the surface to the top of the screen. The fine sand is pumped out through the screen and gravel fed into the space between the casings to replace the sand as it is removed, thus forming a gravel wall around the screen.

—**Screen**—A device placed in a well, designed to admit water from the surrounding area and exclude sand and other substances.

**Wellhole or Drop Manhole**—A vertical shaft in which sewage is allowed to fall from one sewer to another at a lower level.

**Wellhouse Process**—A pressure process in which wood is treated with a water solution of zinc chloride and glue, followed by a solution of tannin.

**Westphal Balance**—A form of balance used in determining the specific gravity of liquids, minerals, fragments, etc.

**Wet Process**—In the manufacture of Portland cement, the limestone and clay (or marl and clay) are crushed, mixed with water, ground and burned wet.

—**Returns**—A heating term referring to the return mains or branches run below the water line of a boiler, receiver or seal to which they connect.

**Wet-Bulb Temperature**—In heating and air conditioning, the lowest temperature which a wetted body will attain when exposed to an

air current. It is measured by a standard thermometer having its bulb wetted by water and exposed to vigorous air circulation.

**Wetted Perimeter**—The length of the wetted contact between the water prism and the containing conduit, measured along a plane at right angles to the conduit.

**W. H.**—In electricity, an abbreviation for watt hour.

**Wharf**—A berthing place for vessels to facilitate direct loading and discharge.

**Wheel Concentration**—The amount of load carried and delivered by one wheel.

—**Control**—(See control column.)

—**Tail**—A wheel used to support the tail of an airplane when on the ground. It may be steerable or nonsteerable, fixed or swiveling.

**Whipping**—The violent slapping back and forth of a wire rope. Jerking a rope so as to produce a wave action.

**White Horse**—Term used by quarrymen to denote a light-colored gneiss, aplite, or pegmatite.

—**Schorl**—The mineral albite.

**Wicket Dam**—A movable barrier in a gully or arroyo made of frames of parallel bars, or shutters, revolving about a central axle.

**Width**—In the case of hollow tile, that dimension measured at right angles to the direction of its thickness and length.

**Wild Steel**—Steel that spits and flies in the ladle, usually caused by over-oxidization of the metal.

**Willemite**—Zinc silicate,  $Zn_2SiO_4$ .

**Williot Diagram**—A graphical method for determining the deflections of a framed structure.

**Wilting Coefficient**—The soil moisture in percentage of dry weight remaining in the soil within the root zone as plants reach a condition of permanent wilting.

**Winch Suspension**—(See suspension, winch.)

**Wind Bracing**—Bracing which takes up the stresses induced by the wind.

**Wind Cone**—(aeronautic) A tapered fabric sleeve pivoted on a standard to indicate the wind direction.

—**Erosion**—Erosion of soil by wind action.

—**Indicator**—(aeronautic) A device that indicates the direction and velocity of the surface wind.

—**Relative**—(aeronautic) The velocity of the air with reference to a body in it. It is usually determined from measurements made at such a distance from the body that the disturbing effect of the body upon the air is negligible.

—**Tee**—(aeronautic) A large T-shaped weather vane located on a landing field or on the top of an adjacent structure to indicate the direction of the wind. It may have the form of an airplane and may be illuminated for night landings. Also called "landing tee."

—**Tunnel**—(aeronautic) An apparatus producing an artificial wind or air stream, in which objects are placed for investigating the air flow about them and the aerodynamic forces exerted on them.

**Winding**—(road) Said of a road which has many sharp turns close together.

—**Spiral**—(See spiral winding.)

—**Unifilar** (electric)—(See unifilar winding.)

**Window, Inspection**—A small transparent window fitted in the envelope of a balloon or airship, or in the wing or fuselage of an airplane, to allow inspection of the interior.

**Windward Chord**—The chord of a span on the windward side (the side from which the wind comes).

**Wing**—A general term applied to the airfoil, or one of the airfoils, designed to develop a major part of the lift of a heavier-than-air craft.

- Wing, Area**—(aeronautic) Wing area is measured from the projection of the actual outline on the plane of the chords, without deduction for area blanketed by fuselage or nacelles. That part of the area, so determined, which lies within the fuselage or nacelles is bounded by two lateral lines that connect the intersections of the leading and trailing edges with the fuselage or nacelle, ignoring fairings and fillets. For the purpose of calculating area, a wing is considered to extend without interruption through the fuselage and nacelles. Unless otherwise stated, wing area always refers to total area including ailerons.
- Axis**—(See axis, wing.)
- Dam**—A well, crib, dike, row of spikes, or other barrier projecting streamward from the shore; a spur dike.
- Fence**—A fence connecting the apron of the stock-guard with the right-of-way or line fence.
- Loading**—The gross weight of an airplane divided by the wing area.
- Profile**—(aeronautic)—The outline of a wing section.
- Rib**—A chord-wise member of the wing structure of an airplane, used to give the wing section its form and to transmit the load from the fabric to the spars.
- Screen**—One having vanes, uniformly spaced, which rotate on a horizontal axis. Usually of large diameter.
- Section**—(aeronautic)—A cross section of a wing parallel to the plane of symmetry or to a specified reference plane.
- Section, Aerodynamic Center of**—(See aerodynamic center.)
- Skid**—(aeronautic) A skid placed near the wing tip to protect the wing from contact with the ground.
- Spar**—A principal span-wise member of the wing structure of an airplane.
- Tip**—The outer end of an airplane wing.
- Wall**—An extension of an abutment wall to retain the adjacent earth.
- Wingheavy, Right or Left**—The condition of an airplane whose right or left wing tends to sink when the lateral control is released in any given attitude of normal flight.
- Wing-Over**—A maneuver in which the airplane is put into a climbing turn until nearly stalled, at which point the nose is allowed to fall while continuing the turn, then returned to normal flight from the ensuing dive or glide in a direction approximately 180 deg. from that at the start of the evolution.
- Wing-Tip Flare**—A pyrotechnic device attached to an aircraft for illuminating the ground while landing.
- Wing-Tip Rake**—(aeronautic) A term referring to the shape of the tip of the wing when the tip edge is sensibly straight in plan but is not parallel to the plane of symmetry. The amount of rake is measured by the acute angle between the straight portion of the wing tip and the plane of symmetry. The rake is positive when the trailing edge is longer than the leading edge.
- Winter Irrigation**—The irrigation of lands during the non-growing season in order to store water in the soil for subsequent use by plants.
- Wire, Bridge**—(See bridge wire.)
- Center**—A wire strand used as a core in a wire rope instead of fiber.
- Cut**—(brick) A brick that has been formed by cutting a column of extruded clay from a press, with wires.
- Cut** (lug paving brick) — These have lugs formed on one side by an eccentric motion of the wires in the cutter. With this brick the

- smooth or die side is in the surface.
- Dam**—Insoil conservation, a dam with the head wall constructed of mesh wire.
  - Finder**—In electricity, a device used for identifying a certain wire in a cable.
  - Ground**—(See ground wire.)
  - Magnet** (electricity)—(See magnet wire.)
  - Mesh**—Series of wires welded or clipped together forming a mesh section, either in sheets or rolls, used in reinforcing concrete pavements.
  - Resistance**—(See resistance wire.)
  - Tie**—(See tie wire.)
  - Tinned**—(See tinned wire.)
  - Wrapped Dam**—A dam made of loose rock enveloped in mesh wire.
  - Witherite**—A barium carbonate,  $\text{BaCO}_3$ , containing 22 per cent carbon dioxide and 78 per cent barite.
  - Witness Corner**—A marker set on a property line leading to a corner; used where it would be impracticable to maintain a monument at the corner itself.
  - Mark; Witness Stake**—A mark or stake set to indicate the position (approximate or exact) of a property corner, instrument station, or other survey point. A witness may be a rock, tree, or other object. Examples: (1) A blazed tree on the bank of a river may indicate the corner which is at the intersection of some survey line with the center line of the stream, and, therefore, cannot be marked directly. (2) A stake driven so as to stand out conspicuously, and marked with a station number, may witness a hub (with nail at exact station) driven flush with or below the surface of the ground.
  - Wollastonite**—A mineral consisting of silica 51.7 per cent and lime 48.3 per cent ( $\text{CaSiO}_3$ ). It commonly results from the metamorphism of calcareous rock or marble where in contact with an igneous rock.
  - Wood Block Pavement**—One having a wearing course composed of wood paving blocks, generally rectangular shape.
  - Preservation**—The art of protecting timber against the action of destructive agents. Usually refers to the treatment of wood with materials which prevent the attack of fungi, termites, marine borers, etc.
  - Workability**—(of Portland cement concrete) Used with reference to concrete mixtures to describe the ease or difficulty which may be encountered in placing the concrete in a particular location.
  - Working Barrel**—The metal tube or pump cylinder, used in a deep well, fastened to the lower end of the drop line, and which contains the valves and piston.
  - Capital**—Assets other than fixed assets and investments, normally necessary to carry on the business; the excess of current assets over liabilities.
  - Load**—The proper load on the rope under working conditions. Found by dividing the breaking strength by a suitable safety factor.
  - WPGH**—Denotes U. S. Works Program Grade Crossing Projects Outside Municipalities.
  - WPGM**—Denotes U. S. Works Program Grade Crossing Projects Within Municipalities.
  - WPGS**—Denotes U. S. Works Program Grade Crossing Projects on Secondary Roads.
  - WPH**—Denotes U. S. Works Program Highway Projects.
  - WPMH**—Denotes U. S. Works Program Highway Projects Within Municipal or Metropolitan areas.
  - WPSO**—Denotes U. S. Works Program Highway Projects on Secondary Roads.
  - Wye** (railroad)—A track with two connecting tracks, arranged like the letter "Y," by means of which rolling stock may be turned.

## X

**X**—In electricity, the symbol for reactance in ohms.

**X-Brace, Longitudinal**—(See longitudinal X-brace.)

**X-Ray Diffraction Pattern**—The pattern of lines obtained by the diffraction of X-rays from a specimen of any material. Each compound usually gives rise to a definite pattern and the obtaining of such a pattern is usually considered as

incontrovertible evidence of the presence of that compound.

**Xenoblast**—A term applied to crystals, in metamorphic rocks, which do not have their own proper crystal faces.

**Xenolith**—A fragment of other rock or of an earlier solidified portion of the same mass inclosed in an igneous rock.

**Xi**—In electricity, the symbol for inductive reactance in ohms.

## Y

**Yard**—In railroad use, a system of tracks within defined limits provided for making up trains, storing cars, and other purposes, over which movements not authorized by time table or by train-order may be made, subject to prescribed signals, rules, or instructions.

—**Capacity** (standing)—The sum of the capacities of all the tracks in that yard on which cars may be permitted to stand.

(Working) The maximum number of cars that can be regularly dispatched from that yard daily.

—**Classification**—A yard in which cars are classified or grouped in accordance with requirements.

—**Coach**—A yard in which passenger train cars are assembled, classified or prepared for service.

—**Departure**—A yard in which cars are assembled in trains for forwarding.

**Yarding Lines**—Wire rope used for piling up logs ready for loading after they have been skidded.

**Yaw**—An angular displacement about an axis parallel to the normal axis of an aircraft.

—**Line**—A line dropped from the bow of an airship, when mooring to the mast, to be coupled to the mast yaw line and act as a steadying line to prevent yawing and overriding the mast.

**Yawing**—(aeronautic) Angular motion about the normal axis.

**Yawmeter**—An instrument that measures the angle of yaw of an aircraft.

**Y-Connected Armature**—In electricity, a three phase armature having one end of each phase winding connected in common to a point.

**Yellow Ocher**—A soft earthy variety of limonite.

**Yield**—(of P. C. concrete) Refers to the quantity of concrete produced from a sack of cement.

—**Point**—Stress at which marked increase in deformation of specimen occurs without increase in load as determined usually by drop of beam or with dividers for tensile, compressive, or transverse tests.

—**Specific** (groundwater)—(See specific yield.)

# Z

**Z-Bar Column**—A fabricated column composed of four Z-bars and one web plate riveted together.

**Z-Iron**—A piece of flat iron, sharpened on one edge and bent to the shape of the letter Z, used for driving into the end of a piece of wood to prevent splitting.

—Iron rolled in the shape of a bar having a cross-section resembling the letter Z, but with the web at right angles to the planes of the flanges.

**Zeolite**—A generic term for a group of minerals occurring in cracks and cavities of igneous rock, especially the more basic lavas. A group of hydrous silicates composed, like the feldspars, of aluminum with alkalic and alkali-earth metals. They are for the most part secondary minerals which have been formed at the expense of feldspars and feldspathoids by heated circulating waters and steam.

**Zero-Lift Angle**—(aeronautic) The angle of attack of an airfoil when its lift is zero.

**Zinc Chloride**—Salt formed by the action of hydrochloric acid upon zinc. Extensively used as a wood preservative.

**Zincite**—A zinc oxide,  $ZnO$ , containing 20 per cent oxygen and 80 per cent zinc.

**Zircon**—A complex silicate containing zirconium and silica. Usually occurs in crystalline rocks, such as gneiss, schists, granites, etc.

**Zonal-Structure**—A term especially used in microscopic work to de-

scribe those minerals whose cross-sections show their successive concentric layers of growth.

**Zone, Deposited Metal**—In welding, that portion or area of the weld metal zone of a fusion weld external to the original surface and/or edge planes provided for the weld and consisting substantially of deposited metal.

—**Fusion**—In welding, that portion of the weld metal zone bordering on the unmelted base metal.

—**Of Fracture**—The upper portion of the earth's crust and in which rocks are deformed mainly by fracture.

—**Of Saturation**—The zone of the lithosphere in which the functional interstices of permeable rock or earth are completely filled with water under hydrostatic pressure.

—**Refined**—In welding, that portion or area of the base metal bordering on the fusion zone wherein grain refinement has taken place, due to the welding heat.

—**Sample**—A sample taken from any desired depth or zone in a tank or, more particularly, a tank car.

—**Unaffected**—In welding, that portion of the base metal outside of the refined zone wherein no change in grain size has taken place.

—**Weld, Metal**—That portion of a weld which has been heated to the plastic, molten and/or vapor states.

**Zoom**—To climb for a short time at an angle greater than the normal climbing angle, the airplane being carried upward at the expense of kinetic energy.

# APPENDIX I

## ENGLISH-SPANISH HIGHWAY NOMENCLATURE

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### NOTAS

- (.) *punto y coma*, indica diferente acepción.  
(,) *coma*, indica otra palabra para la misma acepción.  
Ejemplos:

### NOTES

- (;) semi-colon indicates different meaning.  
(,) comma indicates other word of similar meaning.

#### Examples:

- pier—pila; espigón.  
slope—talud; coeficiente angular.  
elevator—elevador, ascensor.  
broken—picado, triturado, machacado.

### ABREVIATURAS—ABBREVIATIONS

- Agric.—agricultura (agricultural).  
Agrim. agrimensura (surveying).  
Arq.—arquitectura (architecture).  
Ast.—astronomía (astronomy).  
Elec.—electricidad (electricity).  
(F. C.)—ferrocarril (railroad).  
Geol.—geología (geology).  
Hidrául.—hidráulica (hydraulic).  
Mar.—marítimo (nautical).  
Min.—mineralogía (mineralogy).

### A

- abrasion—rozamiento, frotación; desgaste por rozamiento o frotación.  
abutment—estribo (de un puente); contrafuerta.  
adhesion—adhesión.  
aggregate—agregado; ingrediente.  
coarse aggregate—agregado grueso.  
fine aggregate—agregado fino.  
align (to)—alinear.  
alignment—alineación.  
allowable—permisible, admisible.  
allowance—concesión; margen.  
alluvial deposit—depósito de aluvión.  
angle—ángulo.  
anticlinal—anticlinal.  
appliance—instrumento, aparato.  
approach—acceso; apbroche.

### B

- back-fill, back filling—relleno, rehincho.  
back water—remanso.  
bag—saco.  
bail—fianza, garantía.  
bail (to)—achicar.  
barbed wire—alambre de púas.  
barge—balsa, chalana, pontón, bongo.  
barrack—barraca, barracón; cuartel.  
barrel—barril.  
barrel-vault—bóveda de cañón.  
barren—árido, estéril.  
barrow—angarillas.  
wheel-barrow—carretilla.  
basement—basamento, zapata; sótano.  
batch—templa.  
batter—talud, inclinación.  
batter-post—tornapunta.

- batter-pile—pilote inclinado.  
basalt—basalto.  
beam—viga, vigueta; rayo (de luz); haz (de luz); balancín (de una máquina); brazo (de una balanza).  
I-beam—viga doble T.  
bearing—apoyo, soporte; rumbo magnético, orientación; chumacera, cojinete.  
bench-mark—referencia de nivel.  
bending—flexión.  
bent—caballete, burro, palizada.  
berm—banqueta, berma.  
bevel—bisel, chafián.  
bid (to)—ofrecer (en subasta); pujar.  
bid—licitación, proposición, oferta.  
bidder—licitador, postor.  
bidding—subasta.  
bin—tolva, depósito.  
coal-bin—carbonera.  
bind (to)—ligar, amarrar.  
binder—aglomerante.  
binding—ligazón, amarre.  
bitumen—betún.  
bituminous—bituminoso.  
bituminous concrete—hormigón bituminoso.  
black gumbo—tierra negra arcillosa.  
blast (to)—volar; explotar.  
blast—voladura, explosión.  
blast-furnace—alto horno.  
bilge-pump—bomba de achique.  
bond (to)—adherir, amarrar.  
bond—trabazón, amarre; aparejo; fianza.  
booster-pump—bomba auxiliar.  
bore (to)—taladrar, barrenar, perforar; calibrar; dar calas.  
boring—perforación; cala, calicata.  
borrow-pit—zanja de prestamo.  
bottom measurement (in situ)—medida en emplazamiento ("in situ").  
boulder—canto rodado; pedruzco.  
box-culvert—tajea.  
brace (to)—arriostrar (estructuras); entibar (zanjas, túneles).  
brace—riostra.  
bracing—arriostrado; entibado.  
brackish—salobre.  
brackish water—agua estancada; agua salobre.  
brake—freno.  
brake-man—guarda-freno.  
breast-wall—muro de revestimiento; antepecho.  
brick—ladrillo.  
brick-layer—albañil.  
brick-work—fábrica de ladrillo, obra de ladrillo.  
fire-brick—ladrillo refractario.  
sun-dried brick—adobe.  
bridge—puente.  
cantilever bridge—puente en voladizo, puente cantilever.  
deck bridge—puente de tablero superior.  
draw bridge—puente levadizo.  
ferry bridge—puente trasbordador.  
foot bridge—puente de peatones.  
lift bridge—puente levadizo vertical.  
pontoon bridge—puente de barcas, puente de pontones.  
suspension bridge—puente colgante.

through bridge—puente de tablero inferior.  
 brittle—frágil, quebradizo.  
 brittleness—fragilidad.  
 broken stone—piedra picada, piedra partida,  
 piedra machacada, piedra triturada.  
 brush—cepillo; brocha; (Elec.) escobilla.  
 bucket—cubo; cucharón.  
 bucketful—capacidad de un cubo.  
 buckle—hebilla.  
 bulge (to)—hincharse, ensancharse.  
 bulk—volumen; a granel.  
 bulkhead—contén; mamparo (en barcos).  
 bulky—voluminoso.  
 bunk—tarima; litera.  
 bunker—carbonera; pañol de carbón (en barcos).  
 bureau—departamento, negociado, agencia, oficina.  
 Weather Bureau—Oficina Meteorológica.  
 Bureau of Roads and Bridges—Negociado de Caminos y Puentes.  
 Burlap—lona, tejido de saco.  
 burst (to)—reventar, explotar.  
 bushing—bujé, cojinete, forro de metal, guarnición de metal.  
 butt—extremo; cabo, tope.  
 butt joint—junta a tope.  
 buttress—contrafuerte.  
 flying-buttress—(Arq.) arbotante.  
 by-product—producto secundario, sub-producto.

## C

caisson—cajón.  
 cake—pastilla, torta; pan.  
 caldron—caldero.  
 calk (to)—calafatear.  
 calker—calafate.  
 camber—comba; flecha.  
 camp—campamento.  
 cantilever beam—viga volada.  
 cam—leva.  
 canvas—lona, cañamazo.  
 caoutchouc—caucho.  
 canyon—cañon, garganta, desfiladero.  
 cap—cargadera, carrera.  
 capstan—cabrestante.  
 car—carro, vagón; furgón.  
 cargo—cargamento.  
 cart—carretón, carro.  
 cartage—conducción, acarreo.  
 carve (to)—cincelar, tallar, esculpir.  
 case—estuche; caja; forro.  
 cask—tonel, pipa, barril; casco.  
 cast—fundido, vaciado, moldeado.  
 cast iron—hierro fundido, hierro de fundición.  
 casting—fundición.  
 catch—tope; enganche.  
 catch-basin—tragante.  
 caterpillar tractor—tractor de estera.  
 cement—cemento.  
 natural cement—cemento natural.  
 Portland cement—cemento Portland.  
 quick setting cement—cemento de fraguado rápido.  
 certificate, certification—certificado, certificación.  
 chain—cadena.  
 Gunter's chain (66 ft.=20.117 m.)—cadena de Gunter, cadena del agrimensor (en los E. U.).  
 Engineer's chain (100 ft. or 20 m.)—cadena (de ingeniero); doble decámetro (en el sistema métrico).  
 chainman—cadenero.  
 chalk—yeso; tiza, greda.  
 chamfer—chafilán.  
 check (to)—contener, retener, cuartear.  
 check—comprobación; represión; cuarteadura.  
 check-valve—válvula de retención.  
 chill—enfriamiento.  
 chip—pedacito; astilla.  
 chisel—cincel; escoplo, formón.  
 chord—cuerda, cordón.  
 lower-chord (of a bridge)—cordón inferior (de un puente).  
 upper-chord (of a bridge)—cordón superior (de un puente).  
 clamp (to)—apretar.  
 clamp—grapa.  
 clamp-screw—tornillo de presión.  
 clay—arcilla, barro.  
 clear—claro, libre.  
 clear span—luz libre.  
 clearing—tala.  
 cleavage—resquebradura; crucero.  
 clevis—abrazadera.  
 cliff—farallón, risco.  
 clinker—"clinker."  
 clock-work—aparto de relojería.  
 coarse—grueso, basto.  
 coarse aggregate—agregado grueso.  
 coat—capa, mano.  
 coat of paint—mano de pintura.  
 cobble, cobble stone—guijarro.  
 coction—cocción.  
 coffer-dam—ataguía.  
 cohesion—cohesión.  
 coke—cok, coque.  
 collapse—derrumbe, derrumbamiento.  
 collect (to)—recoger, captar.  
 column—(Arq.) columna pié derecho, puntal, poste.  
 compass—compás; brújula.  
 surveyor's compass—compás; brújula del agrimensor.  
 pocket compass—brújula de bolsillo.  
 compression—compresión.  
 compressive—de compresión.  
 compressive stress—esfuerzo de compresión.  
 concrete—hormigón.  
 concrete mixer—mezcladora de hormigón, hormigonera.  
 bituminous concrete—hormigón bituminoso.  
 cement concrete—hormigón de cemento.  
 reinforced concrete—hormigón armado.  
 condemn (to)—confiscar, expropiar.  
 congestion—acumulación, concentración.  
 traffic congestion—concentración del tránsito.  
 contour line—curva de nivel.  
 contour interval—equidistancia (de las curvas de nivel).  
 contour map—plano con curvas de nivel.  
 contrivance—invención, mecanismo, dispositivo.  
 control (to)—gobernar, dominar, controlar.  
 control—gobierno, dominio, control.  
 conveyance—conducción, transporte.  
 cord—cuerda, cordel, cabo; cuerda de leña.  
 core—núcleo, alma; centro; cala; taco.  
 corner—esquina.  
 corner-stone—piedra angula; primera piedra.  
 corrosion—corrosión.  
 corrugate—acanalado.  
 corrugated iron—hierro acanalado, hierro ondulado, palastro ondulado.  
 cotton-waste—desperdicios de algodón.  
 counterweight—contrapeso.  
 couple (to)—acoplar.  
 coupling—acoplamiento; (F. C.) enganche.  
 course—carrera, curso; hilada; capa.  
 piston-course—carrera de émbolo.  
 cover-plate—cubre-junta.  
 covering—cubierta; envoltura.  
 cow-catcher—(F. C.) defensa; "bota-ganado."  
 crack—grieta.  
 crane—grúa.

traveling-crane—grúa viajera.  
 crank—manubrio, manivela.  
 crank-shaft—eje cigüeñal.  
 crank-pin—botón del manubrio o de la manivela.  
 creek—arroyo.  
 crevice—hendedura; grieta.  
 crib—armazón; jaula.  
 crib-work—emparrillado.  
 cross-section—sección transversal.  
 cross-section paper—papel cuadrículado.  
 cross-wires—hilos del retículo.  
 cross-head—cruceta.  
 cross-tie—(F. C.) traviesa.  
 crowbar—palanca; barreta.  
 crown—bombeo.  
 crucible—crisol.  
 crude—crudo.  
 crude oil—petróleo crudo.  
 crumble (to)—deshoronarse.  
 crush (to)—aplastar, triturar, machacar.  
 crusher—tritadora.  
 crushing—aplastamiento.  
 culvert—tajea.  
 curb (to)—contener.  
 curb—contén.  
 cure (to)—sazonar; curar.  
 current—corriente.  
 direct current—corriente continua.  
 alternating current—corriente alterna.  
 current-meter—velocímetro.  
 cushion—cojín; colchón.  
 cut—corte, excavación, desmonte.

## D

dam—presa.  
 dam (to)—represar.  
 damp—húmedo.  
 dampness—humedad.  
 daub (to)—embadurnar, embarrar.  
 dead-load—carga permanente.  
 debris—escombros; fragmentos.  
 decay—deterio, descomposición.  
 deck-bridge—puente de tablero superior.  
 declination—declinación.  
 deflection—desviación.  
 deflection angle—ángulo de desviación.  
 deflection angle—ángulo de inflexión.  
 degree—grado.  
 degree of a curve—grado de una curva.  
 demolish (to)—demoler; derribar.  
 departure—(Agrim.) latitud.  
 derrick—grúa, cabria; machina.  
 design (to)—proyectar, calcular; diseñar.  
 design—proyecto, cálculo; diseño.  
 designer—proyectista.  
 detector—indicador.  
 detour—desvío.  
 development—desarrollo.  
 deviation—desviación.  
 device—invento; aparato, artificio.  
 devise (to)—idear, inventar.  
 dial—esfera (de reloj); disco graduado.  
 diamond—diamante; rombo.  
 die—troquel; cubo; dado.  
 dig (to)—excavar; cavar.  
 dike—dique.  
 dimension—dimensión; cota.  
 dip—inclinación vertical; inmersión; (Geol.) declivio.  
 dip of the needle—inclinación (vertical) de la aguja.  
 dipper—cucharón.  
 dipper dredge—draga de cucharón, draga de palanca.  
 dirt—basura; tierra.  
 disc, disk—disco.  
 discharge—descarga.

ditch—cuneta, zanja.  
 intercepting ditch—cuneta de coronación.  
 side-ditch—cuneta.  
 diver—buzo.  
 diver's helmet—escafandra.  
 diving apparatus—aparato de bucear.  
 diversion—desviación.  
 divider—compás de puntas.  
 dock—dique.  
 dry-dock—dique seco.  
 wet-dock—muelle.  
 dock (to)—atracar.  
 dovetail—ensambladura a cola de pato o milano; machihembrado.  
 dovetailed—machihembrado.  
 down-stream—aguas abajo.  
 draft—tiro, corriente (de aire); calado (de un barco).  
 draftsman—delineante, dibujante.  
 drag (to)—rastrear.  
 drag—rastra.  
 drag-scraper—pala de arrastre.  
 drain (to)—desecar, desaguar, avenar.  
 drain—tubo o tubería de desagüe; conducto de aguas pluviales.  
 drainage—desagüe, desecación, avenamiento; "drenaje".  
 draw (to)—dibujar, trazar; atraer; tirar.  
 draw bridge—puente levadizo, puente movable.  
 drawn wire—alambre estirado.  
 dredge (to)—dragar.  
 dredge—draga.  
 dredging—dragado.  
 drill (to)—taladrar, barrenar, perforar.  
 drill—barrena, taladro; broca.  
 drive (to)—impeler, impulsar; empujar; forzar; clavar; hincar.  
 driving-shaft—árbol de transmisión.  
 driving-wheel—rueda motriz.  
 to drive a pilot—hincar un pilote.  
 pile-driving machine—martinete.  
 driver—conductor.  
 drop—caída.  
 drum—tambor; cilindro.  
 dry—seco.  
 dry-rot—carcoma.  
 ductile—dúctil.  
 ductility—ductilidad.  
 dull—mate; embotado.  
 dump (to)—vaciar (de golpe); descargar.  
 dump cart—carretón de volteo.  
 dump scow—gánguil.  
 dumping place, dumping ground—lugar de depósito, vertedero.  
 duplex—doble; duplex.  
 duplex pump—bomba de doble acción.  
 dust—polvo.

## E

earth—tierra.  
 earth-work—movimiento de tierra.  
 ebb tide—marea muerta; menguante, vaciante.  
 eccentric—exéntrica.  
 edge—filo, canto, borde, arista.  
 edge-stone—mordiente.  
 efficiency—rendimiento.  
 efficiency of an engine—redimiento de una máquina.  
 efficient—eficaz.  
 efflorescence—eflorescencia.  
 elevation—elevación, altura; alzado; vista.  
 elevator—ascensor, elevador.  
 embankment—terraplén.  
 embed (to)—empotrar; encerrar.  
 engine—máquina, motor.  
 engineer—ingeniero.  
 Civil Engineer—Ingeniero Civil.  
 Mechanical Engineer—Ingeniero Mecánico.  
 Electrical Engineer—Ingeniero Eléctrico.

erect (to)—erigir, levantar.  
 erosion—erosión, denudación.  
 err (to)—errar; desviarse.  
 establishment of the port—establecimiento del puerto.  
 estimate—cálculo; presupuesto.  
 excavation—excavación, desmonte.  
 exhaust, exhaust steam—vapor de escape.  
 expand (to)—dilatarse.  
 expansion—expansión, dilatación.  
 experiment—experimento, experiencia.  
 explode (to)—explotar, disparar.  
 exploder—disparador.  
 eye-bolt—cáncamo.  
 eye-piece—ocular.

## F

fabric—tejido, tela.  
 face—cara, superficie; paramento.  
 failure—fallo; fracaso.  
 fall—caída.  
 water-fall—salto de agua.  
 false work—andamiaje.  
 fascine—fajina, haz.  
 fasten (to)—afirmar, atar, amarrar, asegurar.  
 fault—falta; (Geol.) falla.  
 faucet—grifo, llave, espita.  
 feed (to)—alimentar.  
 feeder—alimentador.  
 feed-pump, feeding pump—bomba de alimentación.  
 feldspar—feldespato.  
 fence—cerca.  
 stone-fence—cerca de piedra.  
 wire-fence—cerca de alambre.  
 fender—defensa.  
 ferry-bridge—puente trabador.  
 field—campo.  
 field-book—libro o manual de campo.  
 field-glasses—anteojos de campaña.  
 field-work—trabajo de campo.  
 figure out (to)—calcular (numericamente).  
 filament—filamento.  
 file (to)—limar; archivar.  
 file—fila; lima; archivo; legajo.  
 filler—polvo mineral (asfalto).  
 filings—limadura; limalla.  
 fill (to)—llenar, rellenar, terraplenear.  
 fill—terraplén, relleno.  
 stone-fill—pedraplén.  
 fine—fino.  
 fine aggregate—agregado fino.  
 fineness—finura.  
 finish (to)—acabar; dar la última mano; retocar, perfilar.  
 finishing—última mano; retocado, perfilado.  
 fire-brick—ladrillo refractario.  
 fire-wood—leña.  
 fish-plate—barra de empalme; (F. C.) mordaza o brida.  
 fix (to)—arreglar, reparar; fijar.  
 fixtures—accesorios.  
 fixed beam—viga empotrada.  
 flag—bandera; baliza, banderola, jalón; señal.  
 flagstone—laja.  
 flame—llama.  
 flange—ala; pestaña.  
 flange of an I-beam—ala de una viga doble T.  
 flange of a wheel—pestaña de una rueda.  
 flash—destello; llamarada.  
 flash point—punto de inflamación.  
 flat—plano, llano, achatado.  
 flat-bottomed—de fondo plano.  
 flaw—falla; defecto.  
 flexure—flexión.  
 flint—pedernal.  
 float (to)—flotar; (albañ.) enlucir.  
 float—frota, llana.

flood—avenida; desbordamiento; inundación.  
 floor—piso, suelo.  
 floor-beam—cargadera.  
 floor-system—tablero.  
 flow (to)—fluir, correr.  
 flow—corriente.  
 flow-line—contorno de inundación.  
 flush (to)—emparejar; llenar; inundar.  
 flush—a ras, parejo.  
 flux—diluente.  
 fly-wheel—volante.  
 foot-hold—añanzamiento.  
 foot-path—sendero; paseo; "trillo."  
 footing—base; cimentación.  
 ford (to)—vadear.  
 foreman—capataz.  
 forest—monte, bosque, selva.  
 forfeiture—confiscación.  
 forge—forja, fragua.  
 fork—tenedor, pala de gancho; horqueta.  
 form—molde; forma, encofrado.  
 foundation—fundación; cimentación.  
 sub-foundation—fundación.  
 foundry—fundición.  
 frame—marco; armazón; bastidor.  
 frame-work—armazón, esquieltto.  
 freshet—avenida o crecida repentina.  
 friction—roce, rozamiento, fricción.  
 fume—vapor, humo.  
 funnel—embudo.  
 furnace—horno.  
 blast-furnace—alto horno.  
 smelting-furnace—horno de fundición.  
 furrow—surco.  
 fuse—mecha; fusible.

## G

gage, gauge—medida; calibre.  
 pressure gage—manómetro.  
 railroad-gage—ancho de la entrevista.  
 standard (railroad) gage—carrilera de vía normal (ancha).  
 rain-gage—pluviómetro.  
 tide-gage—mareómetro.  
 gallon—galón (1 galón "U. S." = 3.785 litros).  
 gang—cuadrilla.  
 gang-way—puentecillo; acceso.  
 gap—hueco; vacío.  
 garbage—basura; desperdicios.  
 garbage disposal—eliminación de basuras.  
 gasket—empaquetadura; relleno.  
 gate—portada, puerta; entrada; compuerta.  
 gauge (see "gage")  
 gear—engranaje.  
 gear-wheel—rueda de transmisión; rueda dentada.  
 gearing—engranaje; transmisión de movimiento; juego de piezas motrices.  
 belt-gearing—transmisión por correa.  
 girder—viga; viga maestra.  
 reinforced concrete girder—viga de hormigón armado.  
 steel plate girder—viga armada (o compuesta) de alma llena; viga armada de palastro.  
 glue—cola.  
 governor—regulador.  
 governing point—punto obligado (en un trazado).  
 grade (to)—graduar; dosificar, clasificar; fijar las proporciones.  
 grade—rasante; caldad, grado, categoría.  
 grade-crossing—paso a nivel.  
 down-grade, ascending grade—pendiente.  
 up-grade, descending grade—rampa.  
 ruling grade—rasante predominante.  
 maximum grade—rasante máxima.  
 sub-grade—sub-rasante.

grading—explanación; dosificación.  
 grading machine—explanadora.  
 granite—granito.  
 granite block—adoquín de granito.  
 grate, grating—enrejado, emparrillado.  
 grate-bar—parrilla; barrote.  
 gravel—grava, gravilla; guijo, guijarro.  
 gravel walk—paseo de gravilla, paseo arenoso.  
 grease—grasa.  
 grillage—emparrillado.  
 grind (to)—moler; amolar.  
 grind-stone—piedra de amolar.  
 grinding—molida; molienda.  
 groove—ranura.  
 ground—tierra, terreno.  
 groupt—derretido.  
 cement grout—derretido de cemento o de mortero de cemento.  
 grub (to)—desraizar; destronconar.  
 guard—guardia.  
 guard-stone—guarda-cantón.  
 guard-rail—contra-carril.  
 gunpowder—pólvora.  
 Gunter's chain (see "chain")  
 gutter—zanja; cuneta; canal.  
 guy, guy-line—viento, retenida.  
 gypsum—yeso; sulfato de cal.

## H

hammer—martillo; maza (de martinete).  
 hand-book—manual.  
 handling—manipulación, manejo.  
 handle (to)—manipular.  
 handle—mango, cabo, puño; manija; asa; agarradera, manigueta.  
 hard—duro.  
 hardness—dureza.  
 hard-pan—conglomerado; firme.  
 hardware—ferreteria; herrajes.  
 hard water—agua gruesa, agua dura.  
 hardness of water—dureza del agua.  
 hard wood—madera dura.  
 harden (to)—endurecer.  
 harrow—grada; rastrillo.  
 hatchet—hachuela.  
 haul—tiro, acarreo.  
 head—carga hidráulica.  
 head-light—reflector.  
 header—mordiente, bordillo.  
 headquarter—cuartel general; oficina central; domicilio.  
 heart-wood—madera de corazón.  
 heaving—levantamiento; (Geol.) dislocamiento.  
 hedge—seto vivo; cerca viva.  
 height—altura; elevación; peralte (de una viga).  
 helmet (see "diver")  
 hemp—cáñamo.  
 hew (to)—cortar con hacha; desbastar.  
 high-water—pleamar, marea alta, marea llena.  
 highway—carretera.  
 hill—colina, cerro, loma.  
 hilly ground—terreno quebrado.  
 hinge—bisagra; gozne.  
 hinged—articulado.  
 hinged arch—arco articulado.  
 hoist (to)—izar, elevar.  
 hoisting machine—máquina o maquinilla de izar.  
 hole—hueco, agujero.  
 man-hole—registro; registro de inspección.  
 hand-hole—registro de mano.  
 honeycombed—esponjoso; con cavidades; con oquedades.  
 hook—gancho.  
 hook (to)—enganchar.  
 hoop—banda; zuncho; aro.  
 hopper—tolva.

hub—cubo; maza de la rueda; estaca o estaca de tránsito.

## I

ignite (to)—encender.  
 ignition—ignición, inflamación.  
 ignition point—punto de inflamación.  
 implement—herramienta; utensilio.  
 improvement—mejora.  
 indentation—mella, muesca, corte; estampado, hendidura.  
 iron—hierro.  
 cast-iron—hierro fundido, hierro de fundición.  
 wrought-iron—hierro dulce.

## J

jam (to)—atascar (un barreno).  
 jam—apretura; atascamiento.  
 jerk—sacudida; tiró.  
 jet—chorro.  
 jig—criba.  
 join (to)—unir; juntar; ensamblar.  
 joiner—ensamblador.  
 joiner—ensamblador.  
 joint—junta; unión; articulación; nudo (en armaduras).  
 expansion joint—junta de expansión, junta de dilatación.  
 joist—vigüeta de techo; cabio.  
 journal—muñón (parte de un eje que descansa en el soporte).  
 journal-bearing—soporte; cojinete; chumacera.  
 jute—yute.

## K

keg—cuñete.  
 kettle—caldero; vasija.  
 key—llave; clave; cuña; chaveta; manipulador; tecla; cayo.  
 key-stone—clave (de un arco).  
 kiln—horno.  
 lime-kiln—horno de cal, calera.  
 kit—estuche.  
 medicine-kit—botiquín.  
 knob—perilla; bola; botón.  
 knot—nudo; milla náutica.

## L

label—rótulo, etiqueta.  
 labor—labor; trabajo; mano de obra.  
 laboratory—laboratorio.  
 ladder—escalera de mano.  
 lag—retraso; ret ardación.  
 landmark—hito; mojón.  
 lamp—lámpara; farol.  
 lap (to)—montar.  
 lathe—torno.  
 latch—pestillo.  
 lath—listón, listonado; varilla.  
 metal lath—enrejado; malla metálica.  
 lattice—celosía; enrejado.  
 lattice work—celosía.  
 lay out (to)—marcar; replantar; trazar.  
 laying out—replanteo.  
 layer—camada; capa; hilada; colchón; tonga.  
 layman—profano, lego.  
 luitance—eflorescencia lechosa.  
 leach—lejía.  
 lead—plomo; adelanto, ventaja; sonda; plomada.  
 white-lead—albayaalde.  
 lead-line—sondaleza; (Mar.) escandalo.  
 lead-man—sondeador.  
 leak, leakage—salideros; pérdidas; filtraciones; escapes.  
 ledge—afloamiento.  
 level—nivel.  
 levelman—nivelador.

hand-level—nivel de mano.  
 dumble level—nivel rígido.  
 Wye level—nivel de soportes en Y.  
 leveling—nivelación.  
 leveling-rod—mira de nivel.  
 lever—palanca.  
 lever-arm—brazo de palanca.  
 lighter—lancha (de trasbordo), lanchón, chalana.  
 lighterage—lanchaje; derechos de lanchaje.  
 lift-bridge—puente movable vertical.  
 limbus—limbo.  
 lime—cal.  
 lime-light—luz de calcio.  
 lime-putty—masilla de cal.  
 limestone—caliza; piedra caliza.  
 quick-lime—cal viva.  
 slaked-lime—cal apagada.  
 line (to)—alineal; revestir; forrar.  
 line—línea; cabo, cuerda.  
 measuring line—cuerda de medir; (Mar.) corredera.  
 lead-line, sounding line—sondaleza; (Mar.) escandallo.  
 lining—forro; revestimiento.  
 link—eslabón.  
 live-load (see "load").  
 live steam—vapor directo.  
 live wire—alambre cargado (de electricidad).  
 load—carga.  
 breaking load—carga de rotura.  
 concentrated load—carga aislada, carga concentrada.  
 dead load—carga permanente, carga fija.  
 live load—carga accidental, carga variable.  
 uniform load—carga uniformemente repartida, carga uniforme.  
 loam—marga.  
 loadstone—imán, piedra-imán.  
 locate (to)—trazar; situar; replantar, estaquillar; emplazar; localizar.  
 located—trazado; situado; ubicado; replanteado; estaquillado; emplazado; localizado.  
 location—situación; emplazamiento; estudio definitivo; trazado definitivo; replanteo.  
 lock—cerradura; escusa; cámara.  
 lodge, lodging—alojamiento.  
 loop—lazo; gaza.  
 loose material—material suelto; material a granel.  
 low-water—nivel de estiaje; bajamar, marea baja.  
 lot—lote; parcela; solar.  
 lukewarm—tibio, templado.  
 lumber—madera.  
 lumber-man—comerciante en maderas; leñador.

## M

macadam—macadam.  
 macadamize (to)—construir un afirmado macadam.  
 maintenance—entretenimiento, conservación.  
 main—principal; maestra.  
 water-main—tubería maestra.  
 mallet—maceta; mazo; malleto.  
 mangrove—mangle.  
 man-hole (see "hole").  
 mark—marca; referencia.  
 Bench-Mark—Referencia de Nivel.  
 marsh, marshy ground—ciénaga, pantano; terrenos cenagosos; terrenos pantanosos.  
 mash—masa, amasijo.  
 massive—macizo, sólido; voluminoso.  
 maul—mazo.  
 mason—albañil.  
 masonry—albañilería, fábrica.  
 masonry work—obra de fábrica.  
 ashlar masonry—sillería.  
 dry masonry—mampostería en seco.

rubble masonry—mampostería corriente.  
 rubble masonry laid in cement mortar—mampostería hidráulica.  
 mattress—colchón (para revestimiento de diques y laderas).  
 meadow—pradera.  
 mechanism—mecanismo.  
 melt (to)—fundir, derretir.  
 melting point—punto de fusión.  
 member—miembro pieza.  
 structural member—pieza de construcción, pieza de estructura.  
 mensuration—medición, mensura.  
 mesh—malla.  
 mill—molino.  
 mix (to)—mezclar; batir.  
 mixing—mezclado; batido.  
 mixer—mezcladora.  
 concrete mixer—hormigonera, mezcladora de hormigón.  
 mixture—mezcla, mixtura, mistura.  
 model—modelo, patrón, guía.  
 mold, mould—molde moldura; encofrado.  
 monument—monumento; (Agrim.) hito.  
 mortar—mortero.  
 common mortar—mortero ordinario.  
 cement mortar—mortero hidráulico, mortero de cemento.  
 mortise—muesca; cajuela.  
 mortise and tenon—empalme de espiga y cajuela.  
 motive power—fuerza motriz.  
 mow (to)—segar, guadañar.  
 mower—segadora, máquina de segar, máquina de cortar hierba.  
 mud—fango; lodo.

## N

nail—clavo; puntilla.  
 nailing—clavazón.  
 neap tide—marea muerta.  
 neck—cuello, gollote.  
 needle—aguja.  
 magnetic needle—aguja magnética.  
 night watchman—sereno.  
 note-book—cuaderno, libreta; registro.  
 notch—muesca; hendidura.  
 nozzle—boquilla; pitón.  
 nursery (tree nursery)—vivero.  
 nut—tuerca.

## O

object-glass—objetivo.  
 office-work—trabajo de gabinete.  
 offset—distancia normal.  
 oil (to)—aceitar, engrasar.  
 oil—aceite.  
 oil-can—alcuza.  
 oil-cup—copilla de aceite; copilla lubricadora.  
 oil-paint—pintura al óleo, óleo; pintura de aceite.  
 fuel-oil—petróleo combustible.  
 ore—mineral.  
 iron-ore—mineral de hierro.  
 out-fall—salida; descarga; desembocadura (de un caudal de agua).  
 outlet—salida.  
 out-put—producción.  
 overlap (to)—sobreponer; sobrepasar; montar, recubrir.  
 overlapping—recubrimiento.  
 overhauling—reparación general.  
 oversee—sobrestante.  
 overturning—giro, rotación, vuelco.

## P

pacing—medida a pasos.  
 pack (to)—empaquetar; empaçar; prensar, comprimir.

- packing—empaquetadura.  
 pail—cubo, balde.  
 pan—cacerola; caldero.  
 vacuum pan—tacho al vacío.  
 hard-pan—conglomerado.  
 pan of a balance—platillo de la balanza.  
 pane—hoja de vidrio.  
 panel—panel, cuadro, recuadro; tablero; tramo.  
 panel of a truss—tramo ("panel") de una armadura.  
 pantograph—pantógrafo.  
 parallax—paralaje.  
 parapet—baranda; antepecho; parapeto; pretil.  
 parking—estacionamiento.  
 parking place—estación de vehículos.  
 patch—parche; remiendo.  
 path—senda, sendero, camino; recorrido; trayectoria.  
 pattern—plantilla, modelo.  
 pavement, paving—afirmado; pavimento.  
 pawl—gatillo de trinquete; retén.  
 pay-roll—nómina.  
 peat—turba.  
 pebble—guijo, guijarro; china.  
 peg—clavija, estaquilla.  
 percolation—filtración.  
 pick—pico.  
 pick up—recoger.  
 picker—recogedor.  
 piece—pieza; pedazo; trozo.  
 piece of work—obra; trabajo.  
 piece-work—obra pagada por detalles; obra a destajo.  
 pier—pila (de puente); espigón (muelle); macizo (edificio).  
 pig iron—hierro en bruto; (hierro en linotes).  
 pilaster—pilastra.  
 pile—pila; pilote.  
 pile-driver—martinete.  
 pile-driving—hinca de pilotes.  
 sheet-pile—tablestaca.  
 sheet-piling—tablestacada.  
 piling—pilotaje.  
 piling foundation—fundación de pilotaje, cimentación de pilotaje.  
 pilot—piloto, práctico (de puerto); guía.  
 pin—perno; pasador; (Agrim.) aguja.  
 pine—pino.  
 pitch pine—pino de tea, pino tea.  
 white pine—pino blanco.  
 yellow pine—pino amarillo.  
 pinion—piñón.  
 pipe—tubo, caño; tubería, cañería.  
 pit—hoyo; pozo.  
 pitted—picado, punteado.  
 borrow-pit—zanja de préstamo.  
 pitch—inclinación (de un tejado); paso (de un tornillo); paso (de una rueda); resina; brea; pez; betún; tono (de un sonido).  
 pitch circle—círculo primitivo.  
 piston—émbolo, pistón.  
 piston-rod—vástago del émbolo.  
 plan—plan, planta.  
 plane—plano; cepillo.  
 plane-table—(Agrim.) plancheta.  
 planing machine, planer—cepillo mecánico.  
 place—lugar.  
 in place, *in situ*—en emplazamiento, *in situ*.  
 plank—tablón.  
 planking—entablonado.  
 plaster—repello, revoque.  
 plaster of paris—yeso.  
 plant—tren; planta; central.  
 dredging plant—tren de dragado.  
 power plant—central de fuerza o de energía.  
 plate—plancha, placa, chapa, lámina, palastro.  
 plot (to)—trazar, situar, dibujar o marcar en un dibujo.  
 plough (to)—arar.  
 plough—arado.  
 plug—tapón, tarugo, clavija.  
 plumb—plomada; a plomo, vertical.  
 plumb-bob—plombo, plomada.  
 plumb-line—plomada.  
 plumbago—gráfico.  
 plumber—plomero, instalador.  
 plumbing—instalación sanitaria.  
 plunger—émbolo de bomba, émbolo buzo.  
 pocket—bolsillo, bolsa; depósito, cántara (de un gánguil).  
 pole—polo; jalón, banderola, baliza; vara; poste.  
 telegraph pole—poste de telégrafo.  
 pollute (to)—contaminar.  
 polluted water—agua corrompida.  
 pond—estanque.  
 pontoon—pontón.  
 pontoon-bridge—puente de barcas.  
 pony truss—armadura de poca altura; armadura "pony" (que por su poca altura no tiene arrostramiento superior).  
 portal—portada; portal, soportal.  
 post—poste, pilar; pie derecho.  
 powder—pólvora; polvo.  
 power—potencia, fuerza; energía.  
 power house—casa de máquina.  
 pre-cast—previamente fundido.  
 preliminary—preliminar, estudio preliminar.  
 priming—preparación; primera mano; cebado (de una bomba).  
 priming coat—mano de aparear; encolado.  
 printing frame—marco de imprimir.  
 process—procedimiento, tratamiento; operación.  
 profile—perfil.  
 profile paper, cross-section paper—papel cuadrículado.  
 proof—prueba; comprobación.  
 air-proof—hermético.  
 fire-proof—incombustible, refractario.  
 water-proof—impermeable.  
 prop (to)—apuntalar, sostener.  
 prop—puntal, apoyo.  
 proportion—proporción, dosificación.  
 protractor—transportador.  
 prune (to)—podar.  
 pruning—poda.  
 puddle (to)—pudelar.  
 puddling—pudelaye, pudelación.  
 pull (to)—tirar, halar; arrastrar.  
 pull—tirón; tracción.  
 pulley—polea.  
 pump—bomba.  
 air-pump—bomba de aire, máquina neumática.  
 feed-pump—bomba de alimentación.  
 force-pump—bomba impelente.  
 reciprocating pump—bomba de émbolo.  
 suction pump—bomba aspirante.  
 pumping—bombeo.  
 punch—sacabocado; punzón cortador.  
 purlin—correa (de un techo), vigueta.  
 putty—masilla.

Q

quartz—cuarzo.  
 quay—muelle de costa.  
 quick-lime—cal viva.  
 quick-sand—arena movediza.  
 quick-silver—azogue, mercurio.  
 quarry—cantera.  
 quarrying—explotación de canteras.

R

rack—cremallera.  
 rack and pinion—engranaje de cremallera y pinon.

rail—carril, riel; baranda.  
 cable guard rail—cerca defensa de cable.  
 railing—pretil, baranda.  
 hand-railing—pasamano.  
 railroad, railway—ferrocarril, carrilera, vía férrea.  
 rain, rain-fall—lluvia.  
 rain-gauge, rain-gage—pluviómetro.  
 rain-water—aguas pluviales.  
 rake—rastrillo.  
 ram—pisonar, apisonar.  
 ram, rammer—pisón.  
 water-ram—ariete hidráulico.  
 range (to)—alinearse.  
 range—línea, línea de señales; alcance; amplitud.  
 rate—proporción, razón, velocidad; tipo, tarifa, tasa.  
 raw—crudo, en bruto.  
 raw material—materia prima.  
 rafter—vigüeta de techo, cabio.  
 raft—balsa.  
 record (to)—anotar, registrar.  
 record—expediente, archivo, registro;  
 "record"—relación, crónica.  
 recorder—anotador, registrador.  
 reconnaissance—reconocimiento.  
 recording apparatus—aparato registrador.  
 reinforcement—armadura, refuerzo.  
 reinforced concrete—hormigón armado.  
 repairing shop—taller de reparación.  
 report—informe; memoria.  
 research—investigación.  
 reservoir—depósito, embalse, pantano.  
 resurface (to)—recargar, recrecer (un camino).  
 refill—relleno, rehincho.  
 reclamation—aprovechamiento.  
 regulation—reglas, ordenanzas.  
 revetment—revestimiento.  
 resilience—trabajo interno.  
 elastic resilience—trabajo elástico.  
 revolving—giratorio.  
 rib—nervio, costilla.  
 ridge—cerro, colina, cordillera, cresta;  
 (Agri.) camellón.  
 dividing ridge—cresta divisoria.  
 riprap—piedra suelta.  
 rivet—remache, roblón.  
 riveted truss—armadura rígida, armadura remachada.  
 riveting—remache, roblonadura.  
 riveting machine—máquina de remachar, remachadora neumática.  
 road—camino.  
 roadway—firma del camino.  
 rod—vara, varilla; barra; vástago; cabilla; mira.  
 rod-man—portamira.  
 leveling-rod—mira de nivel.  
 self-reading rod—mira parlante.  
 target rod—mira de corredera, mira de tabilla.  
 connecting rod—biela.  
 piston rod—vástago del émbolo.  
 roof—techo.  
 roof-covering—techado, tejado, cubierta.  
 rope—cuerda, sogá, cabo; jarcia.  
 rotary—giratorio.  
 rotate (to)—girar, dar vueltas.  
 rotation—rotación, giro.  
 rough—áspero, rugoso, tosco; aproximado.  
 roughness—asperosidad, rugosidad; aproximación.  
 round—redondo, circular.  
 round-arch—arco de medio punto.  
 roll (to)—rodar, enrollar, cilindrar, aplanar; liminar.  
 roll—rollo, rodillo; cilindro; (Mar.) rol.

roller—rodillo, tambor; cilindro; aplanadora; molino.  
 road roller—aplanadora.  
 rolling—rodadura; cilindrado, aplanamiento; laminación.  
 rolling friction—fricción de rodadura.  
 rolled section—sección laminada, perfil laminado, perfil.  
 rolled steel—acero laminado.  
 route—ruta.  
 royalty—derecho de patente.  
 rubble—ripios; mampuesto.  
 rubble-masonry—mampostería ordinaria.  
 rubble-paving—encachado.  
 ruler—regla.  
 ruling pen—tiralíneas.  
 ruling grade—rasante dominante.  
 run (to)—correr; operar.  
 to run a line of levels—correr una línea de niveles.  
 run-off (to)—escurrir.  
 run-off—(Hidrául.) escurrimiento; (F. C.) distancia.  
 running board—estribo.  
 rut—carril, surco.  
 rust (to)—oxidar, oxidarse.  
 rust—oxidación, herrumbre, orín.  
 rubbish—desperdicio, basura, desecho, broza.

## S

sack—saco; (Geol.) bolsa.  
 sack of cement—saco de cemento.  
 safety—seguridad.  
 factor of safety—factor de seguridad, coeficiente de seguridad.  
 safety valve—válvula de seguridad.  
 sag—flecha, desviación, pandeo; seno.  
 sample—muestra, ejemplar.  
 sand—arena.  
 calcareous sand—arena calcarea.  
 siliceous sand—arena silicea.  
 pit sand—arena de mina, arena de cantera.  
 sandstone—arenisca.  
 sand pit—mina de arena, depósito de arena.  
 sapwood—albura, sámag.  
 sand-blast—soplete de arena.  
 saw—sierra.  
 saw-mill—sierra, taller de aserrió.  
 scale—escala; balanza; escama.  
 scaffold, scaffolding—andamio, andamiaje.  
 scarify (to)—escarificar.  
 scarifier—escarificador.  
 scantling—listón, alfarda.  
 scoop—cucharón, paleta.  
 scour (to)—arrastrar, socavar.  
 scow—chalana, ganguil, pontón, bongo.  
 dump-scow—ganguil.  
 scrap iron—hierro viejo.  
 scrape (to)—rascar, arañar.  
 drag scraper—pala de arrastre.  
 wheel scraper—pala de ruedas.  
 scratch—arañar, rayar.  
 screen—cernidor, criba, tamiz, zaranda; cortina, pantalla.  
 screening—material cernido, producto de la trituradora; rebebo.  
 sea-wall—malecón.  
 seam—costura, unión, veta.  
 search (to)—buscar, investigar.  
 search-light—reflector.  
 season (to)—curar; sazonar; secar, desecar.  
 section—sección, perfil; tramo, extensión.  
 cross-section—sección transversal, corte transversal.  
 sediment—sedimento.  
 semaphore—semáforo.  
 separator—separador, escogedor.  
 set (to)—colocar, ajustar; fraguar.  
 set—juego, surtido, colección.

- setting—colocación; fraguado.  
 quick setting cement—cemento de fraguado rápido.  
 slow setting cement—cemento de fraguado lento.  
 settle (to)—asentarse, fijarse; hundirse; establecerse.  
 sewage—aguas de albañal.  
 sewer—cloaca, alcantarilla.  
 sewerage—sistema de cloacas, alcantarillado.  
 shaft—árbol de transmisión, eje; pozo; gal-  
 tría; (Arc.) fuste, caña.  
 shallow—poco profundo; superficial.  
 shape (to)—conformar; refinar.  
 shatter (to)—quebrar en pedazos.  
 sharp—agudo, afilado; pronunciado; exacto.  
 shaving, wood-shavings—viruta.  
 shear—corte.  
 shearing stress—esfuerzo cortante.  
 shears—tijeras, cizallas.  
 sheave—polea, polea de garganta o de ranura.  
 shed—tinglado, cobertizo.  
 sheet-pile—tablestaca.  
 sheet-piling—tablestacada.  
 shift—cambio, cambio de guardia.  
 shingle—teja de madera.  
 shoe (to)—calzar.  
 pile-shoe—azuque.  
 shore (to)—apuntalar.  
 shore—puntal, soportar; orilla, cesta, litoral.  
 shovel—pala.  
 steam-shovel—pala de vapor, apaleadora.  
 gasoline shovel—pala de gasolina.  
 shrink (to)—contraer.  
 shrinkage—contracción, reducción (de volumen).  
 side—lado, costado.  
 side-slope—talud.  
 side-track—desviadero.  
 side-walk—acera.  
 side-way—paseo.  
 sieve—criba, tamiz.  
 sift (to)—separar, tamizar.  
 sight—vista, mira.  
 signal (to)—señalar, hacer, señales.  
 signal—señal.  
 sill—solera.  
 silt—cieno.  
 site—sitio, situación, emplazamiento.  
 skeleton—esqueleto, armadura.  
 sketch—croquis, bosquejo.  
 sketch with dimensions—croquis acotado.  
 skew—oblicuo.  
 skew bridge—puente oblicuo, puente en esviaje.  
 skirt (to)—rodear, faldear.  
 slake (to)—extinguir, apagar.  
 slaked-lime—cal apagada.  
 slab—losa, placa.  
 slag—escoria.  
 slate—pizarra.  
 sledge, sledge hammer—mandarria.  
 sleeper—durmiente; traviesa de una vía férrea; coche dormitorio.  
 slide rule—regla de cálculo.  
 slide (to)—deslizar, resbalar.  
 slide—deslizamiento.  
 sling—linga, lingada.  
 slip—espacio entre dos espigones.  
 slit—ranura.  
 slope—talud; inclinación, pendiente; ladera, faldá; declive, vertiente; (Matem.) co-  
 eficiente angular.  
 slot—ranura; muesca, hendedura.  
 sludge—lodo, cieno; residuo.  
 slump—asentamiento.  
 slump-test—ensayo de consistencia.  
 smelt (to)—fundir (minerales).  
 smelting—fundición.  
 smoke-stack—chimenea.  
 socket—cajuela.  
 lamp-socket—porta-lámpara.  
 sod—césped.  
 soil—tierra, terreno, suelo.  
 soot—hollín.  
 sound (to)—sonar; sondear.  
 sound—sonido; sonda; sano, sin defectos.  
 sounding, sounding operation—sondeo.  
 sounding lead-line—sondaleza, sonda, (Mar.) escandallo.  
 sounding pole—vara de sondear.  
 source—fuente, origen, manantial.  
 spade—azada, azadón.  
 span—luz.  
 spandrel—enjuta; tímpano.  
 spare parts—piezas de repuesto.  
 specifications—condiciones, estipulaciones.  
 Set of Specifications, specifications—Pliego de Condiciones.  
 specify (to)—especificar, estipular.  
 speedometer—contador de revoluciones.  
 spigot—llave, grifo; espita.  
 spike—clavo, alcayata.  
 spillway—alivedero, vertedero.  
 splice (to)—unir; ensamblar.  
 splice—unión, junta, ensambladura.  
 splice-plate—cubre-junta.  
 splint—astilla.  
 spoke—rayo (de una rueda).  
 spoil bank—caballero.  
 spool—carrete, carretel.  
 spray (to)—regar, rociar, atomizar.  
 spray—surtidor.  
 spring—manantial; muelle, resorte; primavera.  
 spring up (to)—saltar, brotar.  
 springing line—línea de arranque (de un arco).  
 sprinkle (to)—regar.  
 sprocket wheel—rueda (dentada) de cadena.  
 spud—pata, puntal.  
 spur—estribo, estribación; espuela.  
 spur-wheel—rueda cilíndrica.  
 stock—cañón de chimenea.  
 stadia—estadia, taquimetría.  
 transit with stadia wires—taquímetro.  
 staff—vara, báculo.  
 Surveyor's staff—báculo del agrimensor.  
 stagnate (to)—estancar, corromper.  
 stake—estaca, estaquilla, piqueta.  
 stake out (to)—replantear, estaquillar.  
 standard—patrón, tipo, norma; tipo usual.  
 standardization—uniformidad.  
 standardize (to)—uniformar.  
 stand-pipe—torre de agua.  
 station—estación.  
 stove—duela.  
 steam—vapor.  
 steam boiler—caldera.  
 steam roller—aplanadora de vapor, cilindro de vapor.  
 steel—acero.  
 Bessemer steel—acero Bessemer.  
 carbon steel—acero carbono.  
 cast steel—acero fundido, acero colado.  
 crucible steel—acero de crisol.  
 tool steel—acero de herramientas.  
 hard steel—acero duro.  
 manganese steel—acero manganeso.  
 Martin steel—acero Martin.  
 medium steel—acero semi-duro.  
 mild steel—acero dulce.  
 nickel steel—acero níquel.  
 open-hearth steel—acero Siemens-Martin.  
 rolled steel—acero laminado.  
 Siemens steel—acero Siemens.  
 soft steel—acero dulce.  
 steel-works—siderurgia.  
 steep—pendiente fuerte, inclinación fuerte.  
 steep slope—ladera escarpada.

stem—vástago, varilla.  
 step—paso; escalón, peldaño; resalto.  
 stirrup—estribo.  
 stone—piedra.  
   limestone—caliza.  
   sandstone—arenisca.  
   telford stone—raja, cabezote.  
 stone crusher—trituradora.  
 store (to)—almacenar.  
   store-house—almacén.  
 storm water—agua lluvia, aguas pluviales.  
 strain (deformation)—deformación.  
 strap—correa.  
 stream—arroyo; corriente.  
 stress—esfuerzo.  
   compressive stress—esfuerzo de compresión.  
   shearing stress—esfuerzo cortante.  
   tensile stress—esfuerzo de tracción, esfuerzo de tensión.  
   unit stress—esfuerzo por unidad; esfuerzo unitario.  
   working stress—coeficiente de trabajo.  
 stroke—golpe; carrera; rasgo; sonido.  
 stroke of a piston—la carrera del émbolo.  
 structure—estructura.  
   structural—estructural, de construcción.  
   structural member—pieza de construcción.  
 strut—poste, puntal, pie derecho.  
 stucco—estuco.  
 stump out (to)—destroncar.  
 subgrade—sub-rasante.  
 subsoil—subsuelo.  
 sub-structure—infra-estructura, subestructura.  
 suction—succión, aspiración.  
 summary—resumen.  
 superstructure—superestructura.  
 super-elevation—peralte.  
 supply (to)—suministrar, proveer.  
 support—apoyo, soporte.  
 survey (to)—medir, estudiar.  
   survey, surveying—medición, medida, mensura, estudio.  
   land surveying—agrimensura.  
   hydrographic surveying—estudio hidrográfico, hidrografía.  
   topographic surveying—estudio topográfico, topografía.  
   U. S. Hydrographic Survey—Servicio Hidrográfico, Oficina Hidrográfica de los E. U.  
 surveyor, land surveyor—agrimensor.  
 suspension bar—barra de suspensión; pendolón.  
 suspension bridge—puente colgante.  
 swamp—ciénaga, pantano.  
 sway (to)—oscilar, cimbrar.  
 sway-bracing—arriostamiento.  
 swing (to)—balancear, girar, oscilar.  
 swing bridge—puente giratorio.  
 switch—(Elec.) interruptor; (F. C.) cambiavía, aguja; desviador.  
 switch off—desviar.  
 switch board—cuadro de distribución.

## T

table-land—meseta, altiplanicie.  
 tablet—plancha, lápida, tarja.  
 tack—tachuela, puntilla.  
 thumb-tack—chinche.  
 tackle—aparejo.  
   tackle-block—montón de aparejo.  
 tag—rótulo o etiqueta colgante; chapa.  
 tamp (to)—apisonar; atacar (un barreno).  
   tamping—apisonado.  
 tangent-screw—tornillo de coincidencia, tornillo tangencial.  
 tank—depósito, recipiente, tanque.  
 tap—grifo, llave.  
 tape—cinta, tira; (Elec.) cinta aisladora,

measuring tape—cinta de medir.  
 steel tape—cinta de acero.  
 cloth tape—cinta de género, lienza.  
 metallic tape—cinta de género con trama metálica; cinta metálica.  
 tar—alquitrán, hrea.  
 target-rod—mira de tablilla o de corredera.  
 temper (to)—templar, ablandar.  
 templet—plantilla.  
 tenon—espiga.  
 telescope (to)—enchufar.  
   telescope—anteojo, telescopio.  
 tension—tracción, tensión; (Elec.) tensión.  
 tensile stress—esfuerzo de tracción; esfuerzo de tensión.  
 tent—tienda de campaña.  
 tent-fly—toldo (tienda de campaña).  
 teredo, teredo navalis—teredo, "teredo navalis."  
   sea-worm  
 test (to)—ensayar, hacer pruebas.  
   test, testing—ensayo, prueba.  
 testing materials—ensayo de materiales.  
 thicket—maleza.  
 thoroughfare—avenida, vía pública.  
 through-bidge—puente de tablero inferior.  
 thread—hilo, filete.  
 thrust—empuje.  
 tide—marea.  
   high tide—pleamar.  
   low tide—bajamar.  
   mean low tide—marea baja media, promedio de mareas bajas.  
   spring tides—mareas vivas.  
   neap tides—mareas muertas.  
 tie, railroad tie—travesía (de ferrocarril).  
 tie member—tirante.  
 tight—tirante, estirado.  
 water-tight—estanco.  
 tile—losa, loseta, baldosa, azulejo.  
   roof-tile—teja.  
 timber—madera de construcción.  
 tire—llanta; zuncho.  
 toe—arista de la base, pié; base.  
 toll—peaje.  
 tongue—espiga, lengüeta; badajo; (F. C.) agupa.  
 tongue and groove—machihembrado.  
 tool—herramienta.  
 tooth—diente.  
 toothed wheel—rueda dentada.  
 tough—tenaz, compacto; elástico; correoso.  
 toughness—tenacidad.  
 tow (to)—remolcar.  
 trace (to)—trazar, calcar.  
 tracing-cloth—tela de dibujo.  
 track—vía, camino, pista.  
 traffic—tráfico; tránsito, circulación.  
   light traffic—tránsito ligero.  
   heavy traffic—tránsito intenso.  
 transit—tránsito, teodolito invertible (en que el anteojo gira 180 grados).  
 transition curve—curva de transición.  
 transportation—transporte; sistema de transporte.  
 trap—sifón.  
 traveling crane—grúa viajera.  
 traverse—(Agrim.) poligonal; transversal.  
 trellis, trellis-work—celosía; enrejado.  
 trench—trinchera; zanja.  
 trestle, trestle-work—viaducto puente de balletes.  
 tripod—trípode.  
 truck—camión; carretilla.  
   auto-truck—autocamión, camión automóvil.  
 trunk—tronco.  
   trunk-line—línea principal.  
   trunk-sewer—alcantarilla, maestra.

truss—armadura, viga aramda (de alma discontinua, de celosia).  
 tube—tubo, caño.  
 tug (to)—remolcar.  
 tug-boat—remolcador.  
 tunnel—túnel.  
 turnbuckle—tensor, tornillo tensor.  
 turnout—desvío (F. C.).  
 turntable—plataforma giratoria.  
 turpentine—aguarrás.  
 trowel—llana, frota.

## U

ultimate—máximo, final, último.  
 ultimate stress—esfuerzo máximo, esfuerzo de rotura.  
 unclamp (to)—soltar.  
 underground—subterráneo.  
 unhook (to)—desenganchar.  
 undermine (to)—socavar, minar.  
 underpinning—apuntalamiento por la base.  
 unsound—defectuoso.  
 up-stream—aguas arriba.

## V

vacuum—vacío.  
 valley—valle, cuenca, hoya.  
 valve—válvula.  
 vault—bóveda.  
   cylindrical or barrel vault—bóveda cilíndrica o de cañón.  
 veneer (to)—encharar, revestir.  
 veneer, veneering—encharado, revestido.  
 vent—respiradero.  
 vessel—vasija; cámara; barco, buque, navío, embarcación.  
 viaduct—viaducto.  
 vitrify (to)—vidriar.  
 vitrified-clay—barro vidriado.  
 void—vacío vano, intersticio, hueco.  
 voussoir—dovela.

## W

wale—cepo.  
 wall—muro, pared.  
   retaining wall—muro de sostenimiento.  
 warp, warping—alabeo, torcedura.  
 washer—arandela; zapatilla.  
 washout—arrastre  
   { causado por una corriente.  
   { de agua.  
 watchman—guardián, guardia, vigilante.  
 night watchman—sereno.  
 water—agua.  
   drain water—desagüe; aguas pluviales.  
   fresh water—agua dulce.  
   hard water—agua gorda, agua dura.  
   rain water, storm water—agua lluvia, aguas pluviales.  
   salt water—agua salada.  
   sewer water—aguas de albañal.  
   waste water—aguas residuales.  
   water-bound—ligado con agua.  
   water-head—nacimiento o cabecera de un río.  
   water fall—salto de agua.  
   water power—fuerza hidráulica.  
   water shed—cuenca.  
   water-supply—abasto de agua, suministro de agua.  
   water-works—sistema de abastecimiento de agua, acueducto.  
 waterway—vía navegable.  
 way—camino, vía.  
 highway—carretera.

roadway—camino afirmado; firme del camino.  
 wear (to)—gastar, desgastar; resistir el desgaste.  
 wear, wearing—gasto, desgaste.  
 wearing course—capa de desgaste.  
 wearing surface—superficie de desgaste.  
 waste—desperdicio.  
 weather—tiempo (atmosférico).  
 weather-cock, weather-vane—veleta, cata-viento.  
 Weather Bureau—Oficina Meteorológica.  
 weathering—desgaste por la acción del tiempo; resistencia a la acción del tiempo.  
 web—alma, nervio.  
   solid web—alma llena.  
 wedge—cuña, calzo, calza.  
 weep hole—barbacana.  
 weir, measuring weir—vertedero.  
 waste weir—aliviadero, vertedero.  
 wharf—muelle.  
 wharfage—muellaje, derechos de muelle.  
 wheel—rueda.  
   driven wheel—rueda arrastrada.  
   driving wheel—rueda motriz.  
 wheelbarrow—carretilla.  
 wet—húmedo, mojado.  
   soaking wet—empapado, saturado.  
   wetted perimeter—perímetro mojado.  
 whirlpool—remolino de agua.  
 whirlwind—remolino de viento.  
 white—blanco.  
   white-wash—lechada de cal.  
   whiting—blanco de España.  
 winch—torno, montacarga, maquina de izar.  
 wind—viento.  
   wind-gauge—anemómetro.  
   windlass—torno.  
 wind (to)—enrollar, devanar; dar cuerda.  
 wing—aletón, ala, muro en vuelta.  
 wing-wall—muro en ala.  
 wire—alambre, hilo o cuerda metálica.  
 wires (of a telescope)—retículo.  
 wiring—instalación eléctrica; canalización eléctrica.  
 work (to)—trabajar, funcionar; operar, explotar.  
 wood—madera; bosque, monte.  
 wood-shaving—viruta.  
 woodwork—carpintería.  
 fire-wood—leña.  
 hard-wood—madera de corazón.  
 working stress—(see "Stress")  
 working-man—trabajador, jornalero, peón.  
 workmanship—mano de obra.  
 worm—tornillo sin fin; gusano.  
 wrench (to)—arrancar, retorcer.  
 monkey-wrench—llave inglesa.  
 wrought—trabajado; forjado.  
 wrought iron—hierro forjado.  
 wye-level—nivel (de ingeniero) con soportes en forma de Y.

## Y

yard—yarda; patio.  
   lumber yard—depósito de madera.  
   railroad yard—patio (de ferrocarril).  
 yarn—hilo.  
   hemp-yarn—cáñamo.  
 yield (to)—ceder, rendir.  
 yielding point—límite aparente de elasticidad

## Z

Zenith—cenit, zenit.  
 zinc—cinc, zinç.

# APPENDIX II

## SPANISH-ENGLISH HIGHWAY NOMENCLATURE

### A

abasto de agua—water supply.  
 ablandar—temper (to)  
 abrazadera—clevis  
 acabar—finish (to)  
 acanalado—corrugate  
 acarreo—haul  
 acceso—gang-way; approach  
 accesorios—fixtures  
 aceitar—oil (to)  
 aceite—oil  
 acera—sidewalk  
 acero dulce—soft steel, mild steel  
 acero—steel  
 acero Bessemer—Bessemer steel  
 acero carbono—carbon steel  
 acero colado—cast steel  
 acero de crisol—crucible steel  
 acero de herramientas—tool steel  
 acero duro—hard steel  
 acero fundido—cast steel  
 acero laminado—rolled steel  
 acero manganeso—manganese steel  
 acero Martin—Martin steel  
 acero niquel—nickel steel  
 acero semi-duro—medium steel  
 acero Siemens—Siemens steel  
 acero Siemens-Martin—open-hearth steel  
 achicar—bail (to)  
 acoplamiento—coupling  
 acoplar—couple (to)  
 acumulación—congestion  
 adelante—lead  
 adherir—bond (to)  
 adhesión—adhesion  
 ajustar—set (to)  
 admisible—allowable  
 adobe—sun-dried brick  
 adoquín de granito—granite block  
 afianzamiento—foot-hold  
 afilado—sharp  
 afirmado—pavement, paving  
 afirmar—fasten (to)  
 afloramiento—ledge  
 agencia—bureau  
 aglomerante—binder  
 agregado—aggregate  
 agregado fino—fine aggregate  
 agregado grueso—coarse aggregate  
 a granel—bulk  
 agrimensur—surveyor  
 agrimensura—land surveying  
 agua—water  
 agua corrompida—polluted water  
 agua dulce—fresh water  
 agua dura—hard water  
 agua estancada—brackish water  
 agua gorda—hard water  
 agua gruesa—hard water  
 agua lluvia—rain water, storm water  
 agua salada—salt water  
 aguarrás—turpentine  
 aguas abajo—downstream  
 aguas arriba—upstream  
 aguas de albañal—sewage, sewer water  
 aguas pluviales—storm water, rain water  
 aguas residuales—waste water  
 agudo—sharp  
 aguja—needle  
 aguja magnética—magnetic needle  
 agujero—hole

ala—flange  
 alabeo—warp, warping  
 ala de una viga doble T—flange of an I-beam  
 alambre—wire  
 alambre cargado—live wire  
 alambre de puás—barbed wire  
 alambre estirado—drawn wire  
 albañil—mason, bricklayer  
 albañilería—masonry  
 albayalde—white lead  
 albura—sapwood  
 alcantarilla—sewer  
 alcantarilla maestra—trunk sewer  
 alcayata—spike  
 alcuza—oil can  
 aletón—wing  
 alfarda—scantling  
 alimentador—feeder  
 alineación—alignment  
 alinear—align (to), line (to), range (to)  
 aliveadero—spillway  
 alma—web  
 almacén—storehouse  
 almacénar—store (to)  
 alma llena—solid web  
 aliviadero—waste weir  
 alojamiento—lodge  
 alquitrán—tar  
 altiplanicie—table-land  
 alto horno—blast furnace  
 altura—elevation, height  
 amarrar—bond (to), bind (to), fasten (to)  
 amarre—binding; bond  
 amolar—grind (to)  
 ancho de la entrecía—railroad gage  
 andamiaje—false work  
 andamio—scaffold  
 anemómetro—wind gauge  
 angarillas—barrow  
 ángulo—angle  
 ángulo de desviación—deflection angle  
 anotador—recorder  
 anotar—record (to)  
 antejo—telescope  
 anteojos de campaña—field glasses  
 anticlinal—anticlinal  
 apagar—slake (to)  
 aparato—appliance, device  
 aparato de bucear—diving apparatus  
 aparato registrador—recording apparatus  
 aparato de relojero—clockwork  
 aparejo—tackle  
 apisonado—tamping  
 apisonar—ram  
 aplanadora—roller, road roller  
 aplanadora de vapor—steam roller  
 aplastar—crush (to)  
 aplastamiento—crushing  
 a plomo—plumb  
 apoyo—bearing, support, prop  
 apretar—clamp (to)  
 apretura—jam  
 aproche—approach  
 aprovechamiento—reclamation  
 apuntalamiento por la base—underpinning  
 apuntalar—prop (to), shove (to)  
 arado—plough  
 arañar—scratch; scrape (to)  
 arandela—washer  
 arar—plough (to)  
 a ras—flush  
 árbol de transmisión—driving shaft, shaft

archivo—file, record  
 arcilla—clay  
 arco articulado—hinged arch  
 arco de medio punto—round-arch  
 arena—sand  
 arena calcarea—calcareous sand  
 arena de mina—pit sand  
 arenisca—sandstone  
 arena movediza—quick-sand  
 arena silicea—siliceous sand  
 árido—barren  
 ariete hidráulico—water-ram  
 arista de la base—toe  
 armadura—reinforcement; truss  
 armadura de poca altura—pony truss  
 armadura remachada—riveted truss  
 armadura rígida—riveted truss  
 amazón—frame, crb  
 arrancar—wrench (to)  
 arrastrar—pull (to)  
 arrastre—washout  
 arreglar—fix (to)  
 arriostamiento—sway-bracing  
 arriostar (estructuras)—brace (to)  
 arriostado—bracing  
 arroyo—creek, stream  
 articulación—joint  
 articulado—hinged  
 ascensor—elevator  
 asentamiento—slump  
 asentarse—settle (to)  
 áspero—rough  
 asperosidad—roughness  
 aspisionar—tamp (to)  
 aspiración—suction  
 atacar (un barreno)—tamp (to)  
 ataguía—coffer-dam  
 atar—fasten (to)  
 atascamiento—jam  
 atascar—jam (to)  
 astilla—chip, splint  
 atracar—dock (to)  
 autocamión—auto-truck  
 avenida—flood; thoroughfare  
 avenida o crecida repentina—freshet  
 azada—spade  
 azadon—spade  
 azoque—quick-silver  
 azuche—pile-shoe

## B

báculo—staff  
 bajamar—low tide  
 balancear—swing (to)  
 balanza—scale  
 baldosa—tile  
 baliza—flag  
 balsa—raft, barge  
 banda—hoop  
 bandera—flag  
 banderola—pole  
 banqueta—berm  
 baranda—parapet, railing  
 barbacana—weep hole  
 barco—vessel  
 barra—rod  
 barraca—barrack  
 barracón—barrack  
 barra de empalme—fish plate  
 barra de suspensión—suspension bar  
 barro vidriado—vitrified clay  
 barrena—drill  
 barrenar—drill (to), bore (to)  
 barreta—crowbar  
 barril—barrel  
 barro—clay  
 basalto—basalt  
 basamento—basement  
 base—footing, toe

bastidor—frame  
 basto—coarse  
 basura—dirt  
 batido—mixing  
 batir—mix (to)  
 berma—berm  
 betún—bitumen  
 biela—connecting rod  
 bisagra—hinge  
 bisel—bevel  
 bituminoso—bituminous  
 blanco—white  
 blanco de España—whiting  
 bola—knob  
 bolsa—pocket  
 bolsillo—pocket  
 bomba—pump  
 bomba aspirante—suction pump  
 bomba auxiliar—booster-pump  
 bomba de achique—bilge-pump  
 bomba de aire—air pump  
 bomba de alimentación—feed-pump  
 bomba de doble acción—duplex pump  
 bomba de émbolo—reciprocating pump  
 bomba impelente—force-pump  
 bombo—pumping; crown  
 bongo—barge  
 boquilla—nozzle  
 borde—edge  
 bordillo—header  
 bosque—forest, wood  
 bosquejo—sketch  
 botiquín—medicine kit  
 botón—knob  
 bóveda—vault  
 bóveda de cañón—barrel-vault  
 brazo de palanca—lever-arm  
 brea—pitch  
 brocha—brush  
 brotar—spring up (to)  
 brújula de bolsillo—pocket compass  
 brújula del agrimensor—surveyor's compass  
 buque—vessel  
 buje—bushing  
 burro—bent  
 buscar—search (to)  
 butún—pitch  
 buzo—diver

## C

caballero—spoil bank  
 caballete—bent  
 cabio—joist, rafter  
 cabo—line; handle; rope  
 cabrestante—capstan  
 cabria—derrick  
 cacerola—pan  
 cadanero—chainman  
 cadena—chain  
 cadena de Gunter—Gunter's chain  
 cadena (de ingeniero)—engineer's chain  
 caída—drop  
 caído—fall  
 caja—case  
 cajón—caisson  
 cajuela—mortise, socket  
 cal—lime  
 cala—core  
 cal apagada—slaked lime  
 calafatear—calk (to)  
 calcar—trace (to)  
 calcular—design (to), figure out (to)  
 cálculo—estimate  
 caldera—steam boiler  
 caldero—kettle  
 calera—lime-kiln  
 calibre—gage, gauge  
 calicata—boring  
 caliza—limestone

- cal viva—quick-lime  
 calzar—shoe (to)  
 calzo—wedge  
 camada—layer  
 cámara—vessel; lock  
 cambio—shift  
 cambio de guardia—shift  
 camino—path, road, track; way  
 camino—afirmado—roadway  
 camión—truck  
 campamento—camp  
 campo—field  
 canal—gutter  
 cáñamo—hemp, hemp-yarn  
 cañamazo—canvas  
 cáncamo—eye-bolt  
 caño—pipe, tube  
 cañon—canyon  
 cañon de chimenea—stock  
 cantera—quarry  
 canto—edge  
 canto rodado—boulder  
 capa—coat, layer  
 capacidad de un cubo—bucketful  
 capa de desgaste—wearing course  
 capataz—foreman  
 cara—face  
 carbonera—coal-bin, bunker  
 carcoma—dry-rot  
 carga—load  
 carga accidental—live load  
 carga aislada—concentrated load  
 cargadera—floor-beam; cap  
 carga de rotura—breaking load  
 carga fija—dead load  
 carga hidráulica—head  
 cargamento—cargo  
 carga permanente—dead load  
 carga uniformemente repartida—uniform load  
 carga variable—live load  
 carpintería—woodwork  
 carrera—course; stroke  
 carrera de émbolo—piston-course  
 carrete—spool  
 carretera—highway  
 carretilla—truck, wheel-barrow  
 carretón—cart  
 carretón de volteo—dump cart  
 carril—rail; rut  
 carrilera—railroad  
 carro—car  
 casa de máquina—power house  
 cavar—dig (to)  
 ceder—yield (to)  
 celosía—lattice, lattice-work, trellis  
 cemento—cement  
 cemento de fraguado lento—slow setting  
 cement  
 cemento de fraguado rápido—quick setting  
 cement  
 cemento natural—natural cement  
 cemento Portland—portland cement  
 cenit—zenith  
 central de fuerza o de energía—power plant  
 centro—core  
 cepillo—brush; plane  
 cepillo mecánico—planing machine  
 cepo—wale  
 cerca—fence  
 cerca de alambre—wire fence  
 cerca defensa de cable—cable guard rail  
 cerca de piedra—stone fence  
 cerca viva—hedge  
 cernidor—screen  
 cerradura—lock  
 cerro—ridge; hill  
 certificado—certificate  
 césped—sod  
 chafán—bevel, chamfer  
 chalana—barge, scow  
 chapa—plate  
 chimenea—smoke stack  
 china—pebble  
 chinche—thumb-tack  
 chorro—jet  
 chumacera—bearing  
 ciénaga—marsh, marshy ground, swamp  
 cieno—sludge, silt  
 cilindrar—roll (to)  
 cilindro—drum  
 cimbrar—sway (to)  
 cimentación—footing, foundation  
 cinc—zinc  
 cincel—chisel  
 cincelar—carve (to)  
 cinta—tape  
 cinta de acero—steel tape  
 cinta de género—cloth tape  
 cinta de género con trama metálica—metallic  
 tape  
 cintar de medir—measuring tape  
 circular—round  
 círculo primitivo—pitch circle  
 cizallas—shears  
 claro—clear  
 clasificar—grade (to)  
 clavazón—nailing  
 clave—key  
 clave (de un arco)—key stone  
 clavija—peg, plug  
 clavo—spike, nail  
 "clinker"—clinker  
 cloaca—sewer  
 cobertizo—shed  
 cocción—coction  
 coeficiente de trabajo—working stress  
 cohesión—cohesion  
 cojín—cushion  
 cojinete—bushing  
 cojnete—journal-bearing  
 cok—coke  
 cola—glue  
 colchon—mattress  
 colchón—cushion, layer  
 colina—hill, ridge  
 colocación—setting  
 colocar—set (to)  
 columna pié derecho—column  
 comba—camber  
 compacto—tough  
 compás—compass  
 compás de puntas—divider  
 compresión—compression  
 comprobación—proof; check  
 con cavidades—honeycombed  
 concentración del tránsito—traffic congestion  
 concesión—allowance  
 condiciones—specifications  
 conducción—conveyance  
 conductor—driver  
 confiscación—forfeiture  
 confiscar—condemn (to)  
 conformar—shape (to)  
 conglomerado—hard-pan  
 conservación—maintenance  
 construir un afirmado macadam—macadamize  
 (to)  
 contador de revoluciones—speedometer  
 contén—curb; bulkhead  
 contener—check (to)  
 conténer—curb (to)  
 contininar—pollute (to)  
 contorno de inundación—flow-line  
 contra-carril—guard-rail  
 contracción—shrinkage  
 contraer—shrink (to)  
 contrafuerte—abutment  
 contrafuerte—buttress  
 contrapeso—counterweight  
 copilla de aceite—oil-cup

coque—coke  
 cordel—cord  
 cordillera—ridge  
 cordón—chord  
 cordón inferior (de un puente)—lower-chord  
 (of a bridge)  
 cordón superior (de un puente)—upper-  
 chord (of a bridge)  
 correa—strap  
 correa (de un techo)—purlin  
 correr—flow (to), run (to)  
 correr una línea de niveles—to run a line of  
 levels  
 corriente—flow, stream  
 corriente (de aire)—draft  
 corromper—stagnate (to)  
 corrosión—corrosion  
 corriente—current  
 corriente alterna—alternating current  
 corriente continua—direct current  
 cortar con hacha—hew (to)  
 corte—cut; indentation; shear  
 corte transversal—cross-section  
 costado—side  
 costura—seam  
 corta—dimension  
 cremallera—rack  
 cresta divisoria—dividing ridge  
 criba—jig; screen; sieve  
 crisol—crucible  
 croquis—sketch  
 croquis acotado—sketch with dimensions  
 crucero—cleavage  
 cruceta—cross-head  
 crudo—raw, crude  
 cuaderno—note-book  
 cuadrilla—gang  
 cuadro—panel  
 cuadro de distribución—switch board  
 cuartel—barrack  
 cuartel general—headquarters  
 cuarzo—quartz  
 cubierta—covering  
 cubo—bucket, pail; hub  
 cubre-junta—splice-plate, cover-plate  
 cucharón—dipper, bucket, scoop  
 cuello—neck  
 cuenca—valley, watershed  
 cuerda—cord, line, rope  
 cuerda de medir—measuring line  
 cuña—wedge  
 cuneta—side-ditch, ditch, gutter  
 cuneta de coronación—intercepting ditch  
 cuñete—keg  
 curar—cure (to), season (to)  
 curso—course  
 curva de nivel—contour line  
 curva de transición—transition curve

## D

dar calas—bore (to)  
 dar la última mano—finish (to)  
 dar vueltas—rotate (to)  
 declinación—declination  
 de compresión—compressive  
 defecto—flaw  
 defectuoso—unsound  
 defensa—fender  
 definitivo—location  
 de fondo plano—flat-bottomed  
 deformación—strain (deformation)  
 delineante—draftsman  
 demoler—demolish (to)  
 denudación—erosion  
 departamento—bureau  
 depósito—bin, tank, reservoir  
 depósito de aluvión—alluvial deposit  
 depósito de madera—lumber yard  
 derecho de patente—royalty  
 derretido—grout

derretido de cemento—cement grout  
 derretir—melt (to)  
 derribar—demolish (to)  
 derrumbe—collapse  
 desaguar—drain (to)  
 desagüe—drain water, drainage  
 desarrollo—development  
 desbastar—hew (to)  
 descarga—discharge  
 descargar—dump (to)  
 desecación—drainage  
 desecar—drain (to)  
 desenganchar—unhook (to)  
 desgaste por la acción del tiempo—weathering  
 desgaste por rozamiento o fricción—abra-  
 sion  
 deslizamiento—slide  
 deslizar—slide (to)  
 desmonte—excavation, cut  
 desmoronarse—crumble (to)  
 desperdicio—waste  
 desperdicios de algodón—cotton-waste  
 desraizar—grub (to)  
 destello—flash  
 destroncar—stump out (to), grub (to)  
 desviación—deviation, deflection, diversion  
 desviadero—side-track  
 desviar—switch off  
 desvío—detour, turnout  
 deterioro—decay  
 devanar—wind (to)  
 diamante—diamond  
 dibujante—draftsman  
 dibujar—draw (to)  
 diente—tooth  
 dique—dike  
 dilatación—expansion  
 dilatarse—expand (to)  
 diluyente—flux  
 dimensión—dimension  
 dique—dock  
 dique seco—dry-dock  
 disco—disc, disk  
 disco graduado—dial  
 disparar—explode (to)  
 disparador—exploder  
 distancia normal—offset  
 doble—duplex  
 dominar—control (to)  
 dosificación—grading  
 dosificar—grade (to)  
 dovela—voussoir  
 draga—dredge  
 draga de cucharón—dipper dredge  
 dragado—dredging  
 dragar—dredge (to)  
 ductilidad—ductility  
 dúctil—ductile  
 duela—stave  
 dureza—hardness  
 dureza del agua—hardness of water  
 durmiente—sleeper  
 duro—hard

## E

eficaz—efficient  
 eflorescencia—efflorescence  
 eflorescencia lechosa—laitance  
 eje cigüeñal—crank-shaft  
 ejemplar—sample  
 elástico—tough  
 elevación—height, elevation  
 elevador—elevator  
 elevar—hoist (to)  
 eliminación—de basuras  
 embadurnar—daub (to)  
 embalse—reservoir  
 émbolo—piston  
 émbolo buzo—plunger  
 émbolo de bomba—plunger

**embotado**—dull  
**embudo**—funnel  
**empaguetadura**—gasket  
**empaquetar**—pack (to)  
**empalme de espiga y cajuela**—mortise and tenon  
**empapado**—soaking wet  
**emparejar**—flush (to)  
**emparrillado**—crib-work, grillage, grating  
**emplazar**—locate (to)  
**empotrar**—embed (to)  
**empuje**—thrust  
**en bruto**—raw  
**encachado**—rubble-paving  
**encender**—ignite (to)  
**encerrar**—embed (to)  
**enchapar**—veneer (to)  
**enchufar**—telescope (to)  
**encofrado**—form, mold  
**endurecer**—harden (to)  
**energía**—power  
**enfriamiento**—chill  
**engancha**—hook (to)  
**engranaje**—gear, gearing  
**engranaje de cremallera y pinon**—rack and pinion  
**enjuta**—spandrel  
**enrejado**—lattice, metal lath, grate  
**enrollar**—roll (to), wind (to)  
**ensamblador**—joiner  
**ensamblar**—splice (to), join (to)  
**ensayar**—test (to)  
**ensayo**—test, testing  
**ensayo de consistencia**—slump-test  
**ensayo de materiales**—testing materials  
**entablado**—planking  
**entibado**—bracing  
**entrada**—gate  
**entretenimiento**—maintenance  
**envoltura**—covering  
**equidistancia (de las curvas de nivel)**—contour interval  
**erigir**—erect (to)  
**erosión**—erosion  
**errar**—err (to)  
**escafandra**—diver's helmet  
**escala**—scale  
**escalera de mano**—ladder  
**escama**—scale  
**escandallo**—lead-line  
**escarificador**—scarifier  
**escarificar**—scarify (to)  
**escobilla**—brush  
**escogedor**—separator  
**escombros**—debris  
**escoplo**—chisel  
**escoria**—slag  
**esculsa**—lock  
**escurrir**—run-off (to)  
**esfuerzo**—stress  
**esfuerzo cortante**—shearing stress  
**esfuerzo de compresión**—compressive stress  
**esfuerzo de tracción**—tensile stress  
**esfuerzo máximo**—ultimate stress  
**esfuerzo por unidad**—unit stress  
**eslabón**—link  
**espacio entre dos espigones**—slip  
**especificar**—specify (to)  
**esponja**—sponge  
**esponjoso**—honeycombed  
**espuela**—spur  
**esqueleto**—skeleton  
**esquielto**—frame-work  
**esquina**—corner  
**establecimiento del puerto**—establishment of the port  
**estaca**—stake  
**estación**—station  
**estación de vehiculos**—parking place

**estacionamiento**—parking  
**estadia**—stadia  
**estaquilla**—stake  
**estaquillar**—stake out (to)  
**estancar**—stagnate (to)  
**estanco**—water-tight  
**estangue**—pond  
**estéril**—barren  
**estipular**—specify (to)  
**estrado**—tight  
**estribo**—stirrup; spur; running board  
**estribo (de un puente)**—abutment  
**estructura**—structure  
**estructural (de construcción)**—structural  
**estuche**—case, kit  
**estuco**—stucco  
**estudio hidrográfico**—hydrographic surveying  
**estudio preliminar**—preliminary  
**estudio topográfico**—topographic surveying  
**estudiar**—survey (to)  
**etiqueta**—label  
**exacto**—sharp  
**excavación**—excavation, cut  
**excavar**—dig (to)  
**exéntrica**—eccentric  
**expansión**—expansion  
**expediente**—record  
**experimento**—experiment  
**explanación**—grading  
**explanadora**—grading machine  
**explosión**—blast  
**explotación de canteras**—quarrying  
**explotar**—blast (to), burst (to), explode (to)  
**extensión**—section  
**extinguir**—slake (to)  
**extremo**—butt

## F

**fábrica**—masonry  
**fábrico de ladrillo**—brick-work  
**factor de seguridad**—factor of safety  
**fajina**—fascine  
**falda**—slope  
**faldear**—skirt (to)  
**falla**—flaw  
**fallo**—failure  
**falta**—fault  
**fango**—mud  
**farallón**—cable  
**farol**—lamp  
**feldespató**—feldspar  
**ferreteria**—hardware  
**ferrocarril**—railroad, railway  
**fianza**—bail  
**fianza**—bond  
**fijarse**—settle (to)  
**fila**—file  
**filamento**—filament  
**filete**—thread  
**filo**—edge  
**filtración**—percolation  
**final**—ultimate  
**fino**—fine  
**finura**—fineness  
**firma del camino**—roadway  
**firme**—hard-pan  
**flecha**—camber; sag  
**flección**—flexure, bending  
**forja**—forge  
**forjado**—wrought  
**forma**—form  
**forrar**—line (to)  
**forro**—lining  
**forro de metal**—bushing  
**fracasco**—failure  
**frágil**—brittle  
**fragilidad**—brittleness  
**fragua**—forge

fraguado—setting  
 fraguar—set (to)  
 freno—brake  
 fricción—friction  
 fricción de rodadura—rolling friction  
 frota—trowel, float  
 frotración—abrasion  
 fuente—source  
 fuerza—power  
 fuerza hidráulica—water power  
 fuerza motriz—motive power  
 funcionar—work (to)  
 fundación—foundation  
 fundación de pilotaje—piling foundation  
 fundición—foundry; casting, smelting  
 fundido—cast  
 fundir—melt (to)  
 fundir (minerales)—smelt (to)  
 fusible—fuse

## G

galón—gallon  
 gancho—hook  
 ganguil—scow  
 gánguil—dump scow  
 garantía—bail  
 garganta—canyon  
 gastar—wear (to)  
 gasto, desgaste—wear, wearing  
 gatillo de trinquete—pawl  
 gaza—loop  
 girar—rotate (to), swing (to)  
 giratorio—rotary, revolving  
 giro—overturning, rotation  
 gobernar—control (to)  
 gobierno—control  
 gollete—neck  
 golpe—stroke  
 gozne—hinge  
 grada—harrow  
 grado—grade; degree  
 grado de una curva—degree of a curve  
 graduar—grade (to)  
 grafito—plumbago  
 granito—granite  
 grapa—clamp  
 grúa—crane  
 grava—gravel  
 gravilla—gravel  
 greda—chalk  
 grieta—crack  
 grifo—faucet, tap, spigot  
 grúa—derrick, crane  
 grúa viajera—traveling crane  
 guarda—guard  
 guarda-cantón—guard stone  
 guarda-freno—brake-man  
 guadañar—mow (to)  
 guardia—guard, watchman  
 guardián—watchman  
 guebrar en pedazos—shatter (to)  
 guijarro—cobble, cobble stone  
 guijo—pebble, gravel  
 gusano—worm

## H

hacer—signal (to)  
 hacer pruebas—test (to)  
 hachuela—hatchet  
 halar—pull (to)  
 haz—fascine  
 hebilla—buckle  
 hendedura—crevice, slot  
 hermético—air-proof  
 herramienta—implement, tool  
 herrumbre—rust  
 hierro—iron  
 hierro acanalado—corrugated iron  
 hierro de fundición—cast iron

hierro dulce—wrought iron  
 hierro en bruto—pig iron  
 hierro fundido—cast iron  
 hierro viejo—scrap iron  
 hilada—course, layer  
 hilo—thread, yarn  
 hilos del retículo—cross-wires  
 hinca de pilotes—pile-driving  
 hincar un pilote—to drive a pilot  
 hincharse—bulge (to)  
 hito—landmark  
 hoja de vitrio—pane  
 hollín—soot  
 hormigón—concrete  
 hormigón armado—reinforced concrete  
 hormigón bituminoso—bituminous concrete  
 hormigón de cemento—cement concrete  
 hormigonera—concrete mixer  
 horno—furnace, kiln  
 horno de cal—lime-kiln  
 horno de fundición—smelting furnace  
 hoyá—valley  
 hoyo—pit  
 hueco—gap, hole, void  
 humedad—dampness  
 húmedo—damp, wet  
 humo—fume

## I

idear—devise (to)  
 ignición—ignition  
 imán—loadstone  
 impeler—drive (to)  
 impermeable—water-proof  
 impulsar—drive (to)  
 inclinación—batter, slope  
 inclinación (de un tejado)—pitch  
 inclinación fuerte—steep  
 inclinación vertical—dip  
 inclinación (vertical) de la aguja—dip of the needle  
 incombustible—fire-proof  
 indicador—detector  
 informe—report  
 infra-estructura—sub-structure  
 ingeniero—engineer  
 ingeniero civil—civil engineer  
 ingeniero eléctrico—electrical engineer  
 ingeniero mecánico—mechanical engineer  
 ingrediente—aggregate  
 instalación sanitaria—plumbing  
 instalador—plumber  
 instrumento—appliance  
 interruptor—switch  
 intersticio—void  
 inundación—flood  
 invención—contrivance  
 inventar—devise (to)  
 invento—device  
 investigación—research  
 investigar—search (to)  
 izar—hoist (to)

## J

jalón—flag; pole  
 sawa—saw  
 jornalero—working man  
 juego—set  
 junta—joint, splice  
 junta de dilatación—expansion joint  
 junta de expansión—expansion joint  
 juntar—join (to)

## L

labor—labor  
 laboratorio—laboratory  
 la carrera del émbolo—stroke of a piston  
 ladera escarpada—steep slope  
 lado—side

ladrillo—brick  
 ladrillo refractario—fire-brick  
 laja—flagstone  
 lámina—plate  
 lámpara—lamp  
 lancha (de trasbordo)—lighter  
 lanchaje—lighterage  
 latitud—departure  
 lazo—loop  
 lechada de cal—whitewash  
 legajo—file  
 lego—layman  
 leña—leach  
 leña—firewood  
 leñador—lumberman  
 lengüeta—tongue  
 leva—cam  
 levantamiento—heaving  
 levantar—erect (to)  
 libre—clear  
 libro o manual de campo—field-book  
 licitación—bid  
 licitador—bidder  
 ligado con agua—water-bound  
 ligar—bind (to)  
 ligazón—binding  
 limadura—filings  
 limalla—filings  
 limar—file (to)  
 limbo—limbus  
 línea—line, range  
 línea de arranque (de un arco)—springing line  
 línea de señales—range  
 línea principal—trunk line  
 linga—sling  
 lingada—sling  
 listón—lath, scantling  
 listonado—lath  
 litoral—shore  
 llama—flame  
 llamarada—flash  
 llana—float, trowel  
 llano—flat  
 llanta—fire  
 llave—key; spigot  
 llave inglesa—monkey wrench  
 llenar—fill (to)  
 lluvia—rain, rainfall  
 localizar—locate (to)  
 lodo—mud, sludge  
 loma—hill  
 lona—burlap, canvas  
 losa—slab, tile  
 loseta—tile  
 lote—lot  
 lugar—place  
 lugar de depósito—dumping place  
 luz—span  
 luz de calcio—lime-light  
 luz libre—clear span

## M

macadam—macadam  
 maceta—mallet  
 machacar—crush (to)  
 machihembrado—dovetail, tongue and groove  
 machina—derrick  
 macizo—massive  
 madera—lumber  
 madera de construcción—timber  
 madera de corazón—heart-wood  
 madera dura—hard wood  
 maestra—main  
 máquina—engine  
 máquina o maquinilla de izar—hoisting machine  
 malecón—sea-wall  
 maleza—thicket  
 malla—mesh

malla metálica—metal lath  
 mamparo (en barcos)—bulkhead  
 mampostería corriente—rubble masonry  
 mampostería en seco—dry masonry  
 mampostería hidráulica—rubble masonry laid in cement mortar  
 mampostería ordinaria—rubble masonry  
 mampuesto—rubble  
 manantial—source; spring  
 mandarria—sledge, sledge hammer  
 manejo—handling  
 mangle—mangrove  
 mango—handle  
 manipulación—handling  
 manipular—handle (to)  
 mano de aparejo—priming coat  
 mano de obra—labor, workmanship  
 mano de pintura—coat of paint  
 monómetro—pressure gage  
 manubrio—crank  
 manual—handbook  
 máquina de remachar—riveting machine  
 marca—mark  
 marcar—layout (to)  
 marco—frame  
 marco de imprimir—printing frame  
 marea—tide  
 marea alta—high water  
 mareabaja—low water  
 marea baja media—mean low tide  
 marea llena—high water  
 marea muerta—neap tide, ebb tide  
 mareas muertas—neap tides  
 mareas vivas—spring tides  
 mareómetro—tide gage  
 marga—loam  
 margen—allowance  
 martillo—hammer  
 martinete—pile-driver, pile-driving machine  
 masa—mash  
 masilla—putty  
 masilla de cal—lime-putty  
 mate—dull  
 material cernido—screening  
 material a granel—loose material  
 material prima—raw material  
 material suelto—loose material  
 máximo—ultimate  
 maza de la rueda—hub  
 mazo—maul, mallet  
 mecanismo—mechanism  
 mecha—fuse  
 medición—mensuration, survey, surveying  
 medida—gage, gauge; survey  
 medida a pasos—pacing  
 medida en emplazamiento—bottom measurement (in situ)  
 medir—survey (to)  
 mejora—improvement  
 mella—indentation  
 memoria—report  
 menguante—ebb tide  
 mensura—mensuration  
 mercurio—quicksilver  
 meseta—tableland  
 mezcla—mixture  
 mezclado—mixing  
 mezcladora—mixer  
 mezcladora de hormigón—concrete mixer  
 mezclar—mix (to)  
 miembra pieza—member  
 milla náutica—knot  
 mina de arena—sand pit  
 minar—undermine (to)  
 mineral—ore  
 mineral de hierro—iron-ore  
 mira—sight  
 mira de corredera—target rod  
 mira de nivel—leveling rod

mira de tabilla—target rod  
 mira parlante—self-reading rod  
 mistura—mixture  
 mixtura—mixture  
 modelo—model  
 mojado—wet  
 mojón—landmark  
 molde—form, mold  
 moldeado—cast  
 moler—grind (to)  
 molida—grinding  
 molienda—grinding  
 molino—mill  
 montacarga—winch  
 montar—lap (to)  
 monte—forest, wood  
 montón de aparejo—tackle-block  
 monumento—monument  
 mordiente—header, edge stone  
 mortero—mortar  
 mortero de cemento—cement mortar  
 mortero hidráulico—cement mortar  
 mortero ordinario—common mortar  
 movimiento de tierra—earthwork  
 muellaje—wharfage  
 muelle—wet dock, wharf; spring  
 muelle de costa—quay  
 muesca—indentation, notch, slot; mortise  
 muestra—sample  
 muñón—journal  
 muro—wall  
 muro de revestimiento—breast wall  
 muro de sostenimiento—retaining wall  
 muro en ala—wing wall  
 muro en vuelta—wing

## N

negociado—bureau  
 nervio—rib, web  
 nivel—level  
 nivelación—leveling  
 nivelador—levelman  
 nivel de estiaje—low water  
 nivel de mano—hand level  
 nivel de soportes en Y—wye level  
 nivel rígido—dumple level  
 nómina—payroll  
 norma—standard  
 núcleo—core  
 nudo—knot

## O

objetivo—object-glass  
 oblicuo—skew  
 obra—piece of work  
 obra de fábrica—masonry work  
 obra de ladrillo—brick work  
 obra pagada por detalles—piece-work  
 ocular—eye-piece  
 oferta—bid  
 oficina central—headquarters  
 oficina meteorológica—weather bureau  
 ofrecer (en subasta)—bid (to)  
 operar—run (to)  
 ordenanzas—regulation  
 origen—source  
 orilla—shore  
 orín—rust  
 oscilar—sway (to)  
 oxidación—rust  
 oxidar—rust (to)  
 oxidarse—rust (to)

## P

pala—shovel  
 pala de arrastre—drag-scraper  
 pala de gancho—fork  
 pala de gasolina—gasoline shovel

pala de ruedas—wheel scraper  
 pala de vapor—steam shovel  
 palanca—lever; crowbar  
 paleta—scoop  
 palizada—bent  
 pandeo—sag  
 pantano—marsh, marshy ground, swamp;  
 reservoir  
 pantógrafo—pantograph  
 papel cuadrículado—profile paper, cross-section paper  
 paralaje—parallax  
 paramento—face  
 parcela—lot  
 parche—patch  
 pared—wall  
 parejo—flush  
 parrilla—grate bar  
 pasador—pin  
 pasamano—hand railing  
 paseo—foot-path, sidewalk  
 paseo de gravilla—gravel walk  
 paso—step  
 paso a nivel—grade-crossing  
 paso (de un tornillo)—pitch  
 pata—spud  
 patio—yard  
 patrón—model, standard  
 pavimento—pavement, paving  
 peaje—toll  
 pedacito—chip  
 pedazo—piece  
 pedernal—flint  
 pedraplén—stone-fill  
 pedruzco—boulder  
 peldaño—step  
 pendiente—down-grade  
 pendiente fuerte—steep  
 peralte—super-elevation  
 pérdidas—leak, leakage  
 perfil—profile, section  
 perforación—boring  
 perforar—drill (to), bore (to)  
 perilla—knob  
 perímetro mojado—wetted perimeter  
 permisible—allowable  
 perno—pin  
 pestaña—flange  
 pestaña de una rueda—flange of a wheel  
 pestillo—latch  
 petróleo combustible—fuel oil  
 petróleo crudo—crude oil  
 pez—pitch  
 picado—pitted  
 pico—pick  
 pié—toe  
 pié derecho—strut  
 pié derecho—post  
 piedra angular—cornerstone  
 piedra caliza—limestone  
 piedra de amolar—grindstone  
 piedra imán—loadstone  
 piedra machacada—broken stone  
 piedra partida—broken stone  
 piedra picada—broken stone  
 piedra suelta—riprap  
 pieza—piece  
 pieza de construcción—structural member  
 pieza de estructura—structural member  
 piezas de repuesto—spare parts  
 pila—pile  
 pila (de puente)—pier  
 pilar—post  
 pilastra—pilaster  
 pilotaje—piling  
 pilote—pile  
 pilote inclinado—batter pile  
 piloto—pilot  
 pino—pine

pino amarillo—yellow pine  
 pino blanco—white pine  
 pino de tea—pitch pine  
 piñón—pinion  
 pino tea—pitch pine  
 pintura al óleo—oil paint  
 pipa—cask  
 piquete—stake  
 piso—floor  
 pisón—ram  
 pisonar—ram  
 pista—track  
 pistón—piston  
 pizarra—slate  
 placa—plate, slab  
 plancha—plate, tablet  
 plancheta—plane table  
 plano—flat, plane  
 plano con curvas de nivel—contour map  
 planta—plant; plan  
 plantilla—pattern, templet  
 plataforma giratoria—turntable  
 platillo de la balanza—pan of a balance  
 pleamar—high tide, high water  
 pliego de condiciones—set of specifications  
 plomada—plumb line, plumb  
 plomado—plumb bob  
 plomero—plumber  
 plomo—plumb bob, lead  
 pluviómetro—rain gage  
 poco profundo—shallow  
 poda—pruning  
 podar—prune (to)  
 polea—pulley, sheave  
 poligonal—traverse  
 polo—pole  
 polvo—dust, powder  
 polvo mineral (asfalto)—filler  
 pólvora—powder, gunpowder  
 pontón—pontoon, barge, scow  
 portada—portal, gate  
 porta-lámpara—lamp socket  
 portamira—rod-man  
 poste—post, strut  
 poste de telégrafo—telegraph pole  
 postor—bidder  
 potencia—power  
 pozo—pit  
 pradera—meadow  
 preliminar—preliminary  
 preparación—priming  
 presa—dam  
 presupuesto—estimate  
 pretil—railing  
 previamente fundido—pre-cast  
 primera mano—priming  
 primera piedra—cornerstone  
 principal—main  
 procedimiento—process  
 producción—output  
 producto secundario—by-product  
 profano—layman  
 proporción—proportion  
 proposición—bid  
 proveer—supply (to)  
 proyectar—design (to)  
 proyectista—designer  
 proyecto—design  
 prueba—proof, test, testing  
 pudelación—puddling  
 pudelaje—puddling  
 pudelar—puddle (to)  
 puente—bridge  
 puente cantilever—cantilever bridge  
 puentecillo—gangway  
 puente colgante—suspension bridge  
 puente de barcas—pontoon bridge  
 puente de tablero inferior—through bridge  
 puente de tablero superior—deck bridge

puente de peatones—foot bridge  
 puente de pontones—pontoon bridge  
 puente de tablero inferior—through bridge  
 puente de tablero superior—deck bridge  
 puente en esviaje—skew bridge  
 puente en voladizo—cantilever bridge  
 puente giratorio—swing bridge  
 puente levadizo—draw bridge  
 puente levadizo vertical—lift bridge  
 puente movable—draw bridge  
 puente movable vertical—lift bridge  
 puente oblicuo—skew bridge  
 puente trasbordador—ferry bridge  
 puerto—gate  
 pujar—bid (to)  
 puño—handle  
 puntal—strut, spud, prop, shore  
 punteado—pitted  
 puntilla—nail, tack  
 punto de fusión—melting point  
 punto de inflamación—ignition point, flash point  
 punto obligado—governing point  
 punzón cortador—punch

## Q

quebradizo—brittle

## R

rajón—telford stone  
 rampa—up-grade  
 ranura—slot, slit, groove  
 rasgo—stroke  
 rasante—grade  
 rasante dominante—ruling grade  
 rasante máxima—maximum grade  
 rasante predominante—ruling grade  
 rascar—scrape (to)  
 rastra—drag  
 rastrear—drag (to)  
 rastrillo—harrow, rake  
 rayar—scratch  
 rayo (de una rueda)—spoke  
 razón—rate  
 recargar—resurface (to)  
 recoger—picker  
 recoger—pick up, collect (to)  
 reconocimiento—reconnaissance  
 recrecer (un camino)—resurface  
 recubrimiento—overlapping  
 recubrir—overlap  
 redondo—round  
 referencia—mark  
 referencia de nivel—bench mark  
 refinar—shape (to)  
 reflector—searchlight, headlight  
 refractario—fire-proof  
 refuerzo—reinforcement  
 regar—spray (to), sprinkle (to)  
 registrar—recorder  
 registrar—record (to)  
 registro—record; man-hole  
 registro de mano—hand-hole  
 regla—ruler  
 regla de cálculo—slide rule  
 reglas—regulation  
 regulador—governor  
 rehincho—backfill, back filling, rehil  
 rellenar—fill (to)  
 relleno—back-fill, back-filling, fill, refill  
 remache—riveting, rivet  
 remanso—back water  
 remolcador—tugboat  
 remolcar—tug (to), tow (to)  
 remolino de agua—whirlpool  
 remolino de viento—whirlwind  
 rendimiento—efficiency  
 rendimiento de una máquina—efficiency of an engine

rendir—yield (to)  
 reparación general—overhauling  
 reparar—fix (to)  
 repello—plaster  
 replantar—locate (to), lay out (to), stake out (to)  
 replanteo—location, laying out  
 represar—dam (to)  
 resalto—step  
 resbalar—slide (to)  
 residuo—sludge  
 resorte—spring  
 respiradero—vent  
 resquebradura—cleavage  
 resumen—summary  
 retardación—lag  
 retener—check (to)  
 retenida—guy-line  
 retorcer—wrench (to)  
 retraso—lag  
 reventar—burst (to)  
 revestimiento—revetment, lining  
 revestir—line (to); veneer (to)  
 revoque—plaster  
 riel—rail  
 riostra—brace  
 ripios—rubble  
 risco—cliff  
 roblón—rivet  
 roblonadura—riveting  
 roce—friction  
 rociar—spray (to)  
 rodadura—rolling  
 rodar—roll (to)  
 rodear—skirt (to)  
 rodillo—roll, roller  
 rollo—roll  
 rotación—rotation  
 rótulo—label, tag  
 rozamiento—friction, abrasion  
 rueda—wheel  
 rueda cilíndrica—spur-wheel  
 rueda dentada—toothed wheel  
 rueda (dentada) de cadena—sprocket wheel  
 rueda de transmisión—gear wheel  
 rueda motriz—driving wheel  
 rugosidad—roughness  
 rugoso—rough  
 rumbo magnético—bearing  
 ruta—route

## S

sacabocado—punch  
 sacco de cemento—sack of cement  
 saco—sack, bag  
 sacudida—jerk  
 salida—outfall, outlet  
 salideros—leak, leakage  
 salobre—brackish  
 saltar—spring up (to)  
 salto de agua—waterfall  
 sámapo—sapwood  
 sazonar—cure (to), season (to)  
 segar—season (to)  
 sección—section  
 sección laminada—rolled section  
 sección transversal—cross-section  
 seco—dry  
 sedimento—sediment  
 segadora—mower  
 segar—mow (to)  
 seguridad—safety  
 selva—forest  
 semáforo—semaphore  
 señal—signal  
 señalar—signal (to)  
 señales—signal (to)  
 senda—path

sendero—footpath  
 seno—sag  
 separador—separator  
 separar—sift (to)  
 servicio hidrográfico—U.S. Hydrographic Survey  
 seto vivo—hedge  
 siderurgia—steel works  
 sierra—saw  
 sifón—trap  
 silleria—ashlar masonry  
 sistema de abastecimiento de agua—water-works  
 sistema de cloacas—sewerage  
 sitio—site  
 situación—site, location  
 situado—located  
 situar—plot (to), locate (to)  
 sobreponer—overlap (to)  
 socavar—scour (to), undermine (to)  
 sótano—basement  
 soga—rope  
 solar—lot  
 solera—sill  
 sólido—massive  
 soltar—unclamp (to)  
 sonar—sound (to)  
 sonda—lead  
 sondaleza—lead-line, sounding-line  
 sondeador—lead-man  
 sondear—sound (to)  
 sondeo—sounding, sounding operation  
 soplete de arena—sandblast  
 soportal—portal  
 soportar—shore  
 soporte—journal-bearing, support  
 sostener—prop (to)  
 subasta—bidding  
 subestructura—substructure  
 sub-producto—by-product  
 sub-rasante—sub-grade  
 subsuelo—subsoil  
 subterráneo—underground  
 succión—suction  
 suelo—floor, soil  
 sulfato de cal—gypsum  
 suministrar—supply (to)  
 superestructura—superstructure  
 superficial—shallow  
 superficie de desgaste—wearing surface  
 surco—rut, furrow  
 surtido—set  
 surtidor—spray

## T

tablero—floor system  
 tablestaca—sheet-pile  
 tablestacada—sheet-piling  
 tablón—plank  
 tacho al vacío—vacuum pan  
 tachuela—tack  
 taquimetria—stadia  
 taquímetro—transit with stadia wires  
 tajea—culvert, box-culvert  
 tala—clearing  
 taladrar—drill (to), bore (to)  
 taladro—drill  
 taller de reparación—repairing shop  
 talud—batter, slope, side-slope  
 tambor—drum, drum  
 tamiz—sieve, screen  
 tamizar—sift (to)  
 tangué—tank  
 tapón—plug  
 tarifa—rate  
 tarima—bunk  
 tarugo—plug  
 techado—roof-covering

techo—roof  
 teja de madera—shingle  
 tejido—fabric  
 tejido de saco—burlap  
 tela—fabric  
 tela de dibujo—tracing-cloth  
 telescopio—telescope  
 templa—batch  
 templado—lukewarm  
 templar—temper (to)  
 tenacidad—toughness  
 tenaz—tough  
 teja—roof-tile  
 tenedor—fork  
 tensión—tension  
 tensor—turnbuckle  
 teredo navalis—teredo  
 terraplén—embankment, fill  
 terreno—ground, soil  
 terreno quebrado—hilly ground  
 tibio—lukewarm  
 tiempo—weather  
 tienda de campaña—tent  
 tierra—earth, soil, dirt, ground  
 tierra negra arcillosa—black gumbo  
 tijeras—shears  
 timpano—spandrel  
 tinglado—shed  
 tipo—rate; standard  
 tira—tape  
 tiralíneas—ruling pen  
 tirante—tie member; tight  
 tirar—pull (to)  
 tiro—draft, haul  
 tiró—jerk  
 tirón—pull  
 tiza—chalk  
 tolva—bin, hopper  
 tonel—cask  
 tope—catch  
 torcedura—warp, warping  
 tornapunta—batter-post  
 tornillo de coincidencia—tangent screw  
 tornillo de presión—clamp-screw  
 tornillo sin fin—worm  
 tornillo tensor—turnbuckle  
 torno—lathe, winch, windlass  
 torre de agua—standpipe  
 toscó—rough  
 trabajar—work (to)  
 trabajo—labor  
 trabajo de campo—field work  
 trabajo de gabinete—office work  
 trabajo elástico—elastic resilience  
 trabajo interno—resilience  
 trabazón—bond  
 tracción—pull, tension  
 tractor de estera—caterpillar tractor  
 tráfico—traffic  
 tragante—catchbasin  
 tramo—section  
 tramo de una armadura—panel of a truss  
 transportador—protractor  
 tránsito—traffic; transit  
 tránsito intenso—heavy traffic  
 tránsito ligero—light traffic  
 transmisión por correa—belt gearing  
 transporte—conveyance, transportation  
 transversal—transverse  
 tratamiento—process  
 traviesa—cross-tie  
~~traviesa~~ (de tierra) —tie, railroad tie  
 trazado—located  
 trazar—locate (to), lay out (to), plot (to), draw (to), trace (to)  
 tren—plant  
 tren de dragado—dredging plant  
 trinchera—trench  
 tripode—tripod  
 trituradora—crusher, stone crusher  
 triturar—crush (to)  
 troquel—die

tronco—trunk  
 tubería—pipe  
 tubería maestra—water-main  
 tubo—pipe, tube  
 tubo o tubería de desagüe—drain  
 tuerca—nut  
 tunel—tunnel  
 turba—peat

## U

ubicado—located  
 última mano—finishing  
 último—ultimate  
 uniformidad—standardization  
 uniformar—standardize (to)  
 unión—joint, splice, seam  
 unir—join (to), splice (to)  
 utensilio—implement

## V

vaciar (de golpe)—dump (to)  
 vacío—gap, vacuum  
 vacío vano—void  
 vadear—ford (to)  
 vagón—car  
 valle—valley  
 válvula—valve  
 válvula de retención—check-valve  
 válvula de seguridad—safety valve  
 vapor—fume, steam  
 vapor de escape—exhaust steam  
 vapor directo—live steam  
 vara—rod, staff  
 vara de sondear—sounding pole  
 varilla—lath, stem, rod  
 vasija—vessel, kettle  
 vástago—stem  
 vástago del émbolo—piston-rod  
 veleta—weather vane  
 velocímetro—current-meter  
 ventaja—lead  
 vertedero—dumping place, weir, measuring weir; spillway  
 veta—seam  
 vía—track, way  
 vía navegable—waterway  
 viaducto—viaduct  
 viaducto puente de caballetes—trestle  
 vidriar—vitrify (to)  
 viento—guy; wind  
 viga—beam, girder  
 viga aramda—truss  
 viga armada de palastro—steel plate girder  
 viga de hormigón armado—reinforced concrete girder  
 viga doble T—I-beam  
 viga empotrada—fixed beam  
 viga maestra—girder  
 viga volada—cantilever beam  
 vigueta—beam  
 vigueta de techo—rafter, joist  
 viruta—shavings, wood shavings  
 vista—sight  
 voluminoso—bulky, massive  
 vivero—nursery (tree)  
 voladura—blast  
 volante—flywheel  
 volar—blast (to)  
 volumen—bulk

## Y

yarda—yard

yeso—gypsum, chalk, plaster of paris  
 yute—jute

## Z

zanja—ditch, gutter, trench  
 zanja de prestamo—borrow-pit  
 zapata—basement  
 zapatilla—washer  
 zaranda—screen  
 zenit—zenith  
 zinc—zinc  
 zuncho—hoop

## APPENDIX III

### GERMAN-ENGLISH DICTIONARY FOR MINERAL AGGREGATES

Published by courtesy of the National Slag Association

#### A

Abbau—decomposition, disintegration.  
abbilden—describe, represent.  
Abbildung—illustration, copy.  
abbinden—harden, set.  
Abbindezeit—setting time.  
Abdampfung—evaporation.  
Abfall—waste, refuse.  
Abhandlung—treatise, paper.  
abkühlen—cool off.  
Absetzung—deposition, sedimentation.  
Abstufung—gradation.  
abwechselnd—alternating, intermittent.  
abwechselnd—variable.  
abwerfen—runoff (slag).  
Ackerbau—agriculture, farming.  
adsorbieren—adsorb.  
Agrikulturchemie—agricultural chemistry.  
Alkali—alkali.  
als—as.  
alten—old.  
Analyse (en)—analysis, analytical.  
anerkannt—recognizable.  
Angabe—statement, specification.  
angreifen—attack, corrode.  
anhydrisch—anhydrous.  
Annahme—assumption, hypothesis.  
Anordnung—order, action.  
Anschluss—crystallization.  
ansetzen—crystallize, effloresce.  
Antritt—beginning, first step.  
anwässern—moisten, slightly, dampen.  
anwendbar—practical, usable, available.  
anwenden—apply, use, employ.  
Apparat—apparatus.  
Arbeitsfugen—expansion joints.  
Asbest—asbestos.  
Asphaltbeton—asphaltic concrete.  
Asphaltstrassen—asphalt streets.  
auf—on, upon, in, at, into, to.  
Auflösung—solution, loosening, undoing de-  
composition.  
Auflösungsmittel—solvent.  
Aufsatz—article.  
Ausbildung—construction, manufacture.  
ausführen (ung)—carry out, perform, pattern.  
Ausnahme—exception.  
Auswitterung—weathering, efflorescence.

#### B

Bachsteinofen—brick kiln.  
Barnstein—brick.  
basisch—basic.  
Bauordnungswesen—road construction pro-  
gram.  
Bausand—building sand, mortar sand.  
Baustein—building stone, brick.  
Bauwerke—structures.  
Bauzwecke—building purposes.  
beachten—observe, notice.  
Beanspruchung—stress, strain.  
Bedeutung—meaning, significance.  
Bedingung—condition, stipulation, restriction,  
limitation.  
bei—in, near, to.  
Beimengung—admixture, impurity.  
Beimischung—admixture, addition.  
Beisatz—admixture, addition.  
Benennung—nomenclature.  
Beobachtung—observation, observance.

bereits—already.  
Bereitung—preparation, manufacture.  
Bergbau—mining.  
Bericht—report.  
Beschlag (en)—coating, become coated.  
beschleunigen—accelerate, hasten.  
Beschwerungsmittel—weighting agent, filler.  
Besonderheit—peculiarity, property.  
besonders—especially.  
beständig—durable, stable.  
Beständigkeit—stability, durability.  
bestehen—composition.  
Bestimmung—determination.  
Beton—concrete.  
Betonstrassen—concrete roads.  
beträchtlich—considerable, important.  
Betragen—behaviour, conduct.  
Bewegung—motion, movement, stirring.  
biegen—bend.  
Bindekraft—binding power.  
Bindemittel—binding agent or material ce-  
ment.  
Bodenkolloid—soil colloid.  
Bodenuntersuchung—soil research.  
Breachbacken—crusher jaws.  
bröckelig—brittle, friable, fragile.  
Bruchstein—quarry stone.  
Brücke—bridge.

#### C

Cbcm—Cubic centimeter.  
chemisch—chemical.  
Chlor—chlorine.  
Chlorcalcium—calcium chloride.  
Colatur—filtrate.

#### D

dabei—thereby  
Dachbau—roofing.  
Dampfbad—steam bath.  
darstellen—produce, make, manufacture.  
dauerhaft—durable, lasting, permanent.  
Deckfähigkeit—covering power.  
Deckmittel—covering material.  
Desagregation—disintegration.  
Dichte—density.  
Dreofen—revolving furnace.  
Druck—pressure, compression.  
Druckfestigkeit—compressive strength.  
Düngmittel—fertilizer.  
durch—through, by means of.  
durchlässig-keit—permeable, permeability.

#### E

Eigengewicht—specific gravity.  
Eigenschaft—property.  
Einfluss—influence.  
Eisenbeton—reinforced concrete.  
Eisenbetonbau—reinforced concrete construc-  
tion.  
Entwicklung—development.  
erfinden—invent, devise, find out.  
Erhaltung—conservation, preservation.  
Ersatz—substitute, equivalent.  
Erstarrung—solidification.

#### F

Fabric—factory, works, mill.  
Fällung—precipitation, precipitating.  
Fein—fine.  
Feinschlacke—refinery slag.

Felsen—rock.  
 fest—solid, firm, compact.  
 Festigkeit—strength.  
 feucht—moist, humid, damp.  
 Feuer—fire.  
 Feuerbeständig—fire resistant.  
 flüssig—liquid, fluid.  
 Flusspulver—flux powder.  
 folgendermassen—as follows.  
 folgenderweise—as follows.  
 fördern, Förderung—further, help, hasten.  
 Form—form, shape.  
 Forsetzung—continuation, prosecution, pursuit.  
 Fortschritte—progress.

## G

Gasgemenge—gas mixture.  
 Gasgemisch—gaseous mixture.  
 gashaltig—containing gas.  
 Gebläseofen—blast furnace.  
 gegenseitig—reciprocal.  
 Gehalt—contents.  
 Gelbildung—gel formation.  
 Gemisch—mixture.  
 geringer—small.  
 Gewicht—weight, gravity.  
 Geissand—molding sand.  
 Gips—gypsum.  
 glasähnlich—glasslike.  
 glasartig—glassy, vitreous.  
 Glaswolle—glass wool.  
 Gleichgewicht—equilibrium, balance.  
 Gleichgewichtszustand—state of equilibrium.  
 granulieren—granulate.  
 Granulierung—granulation.  
 Griess—grit, gravel, coarse sand.  
 gross—large.  
 Grundfeuchtigkeit—soil moisture.  
 Grube—mine, pit, quarry, cavity.  
 Grundmörtel—concrete.  
 Grundlage—foundation, groundwork, base, basis.  
 Grundwasser—ground water.  
 Grus—fine gravel, small fragments.

## H

halb—half.  
 Haltbarkeit, haltbar—stability, stable, durable, strong.  
 Härte—hardness.  
 häufig—frequent, abundant.  
 Haupt—head, chief, main.  
 hauptsächlich—principal, chief, especially.  
 Herstellung—production, preparation, manufacture.  
 hinrichten—turn, direct, execute.  
 Hinsicht—respect, regard, view.  
 Hitze—heat, hot.  
 hoch—high.  
 Hochofenschlacke—blast furnace slag.  
 Hydrat—hydrate.  
 Hydratisieren—to hydrate, become hydrated.  
 hydraulisch—hydraulic.

## I

Im—at, for.  
 immer—always.  
 Inaktivität—inactivity.  
 induzieren—induce.  
 Inhalt—content, contents.  
 Inneintrunkung—penetration.  
 innerhalb—within.  
 Isolationsstoff—insulating material.

## J

Jahr—year.  
 jetzt—now, at present.

## K

Kalk—lime.  
 kalt—cold.

kaltbläsig—refractory.  
 Kalteinbau—cold application.  
 Kalteinbaubelag—cold mix surfacings.  
 Katalysator—catalyzer.  
 Kenntniss—knowledge.  
 Kieselguhr—diatomaceous earth.  
 kieselhaltig—siliceous.  
 klarstellung—explanation.  
 klassifizierung—classification.  
 kleine—small.  
 kochen—cook.  
 Klinkerpflasterbeau—brick pavement construction.  
 Kockpunkt—boiling point.  
 kohlen—carbonize.  
 Kohlensäure—carbon dioxide.  
 Kopfsteinpflaster—stone pavements.  
 Königsäure—aqua regio.  
 konzentrieren—concentrate.  
 Kopf—head.  
 körnen—granulate.  
 körnig—granular, gritty.  
 Körper—body, compound, substance.  
 korrodieren—corrode.  
 kosten—cost.  
 Kraft—force, power, strength, vigor.  
 Kraftfahrzeuge—motor vehicles.  
 Kraftfahrzeuge—motor vehicles.  
 Kreis—circle, circuit, orbit.  
 Kreisbahn—circular path.  
 Kreuzungen—crossings.  
 Kristall—crystal.  
 kristallartig—crystalline.  
 Kristallauscheidung—separation of crystals.  
 Kristallbildung—formation of crystals.  
 Kristallwasser—water of crystallization.  
 kugelförmig—globular, spherical.  
 kühl—cool.  
 Kühlmittel—refrigerant.

## L

Lagerung—arrangement, stratification.  
 Landbau—agriculture.  
 Landstrasse—highway.  
 Langsam—slow.  
 Langsambinder—slow setting cement.  
 laufen—run.  
 leben—live.  
 lebhaft—lively, brisk, active.  
 leblos—lifeless.  
 Lehm—loam.  
 lehren—to learn.  
 leicht—light, easy, slight.  
 leichtflüssig—easily fusible.  
 Leichtigkeit—lightness.  
 leichtlöslich—easily soluble.  
 leider—unfortunately.  
 Leistung—work, performance, service output.  
 leiten—govern, direct, preside over.  
 Leitfähigkeit—conductivity.  
 licht—light, illumination.  
 Lichtbild—photograph.  
 Lieferung—deliver; (of books, etc.) issue, number.  
 liegen—lie, be (situated).  
 los—loose, free.  
 lösbar—soluble.  
 Lösbarkeit—solubility.  
 Lösemittel—solvent.  
 Luft—air, atmosphere.  
 Luftbad—airbath.  
 Luftdruck—air pressure.  
 Luftzug—draft, air duct.

## M

machen—make, do, cause.  
 mächtig—mighty, powerful, strong.  
 mager—lean, slender, thin, meager.  
 magnesiahaltig—containing magnesia.

**Makadam**—macadam.  
**Makadamdecken**—macadam surfaces.  
**Mangan**—manganese.  
**Mass**—measure.  
**Massformel**—standard formula.  
**Massgabe**—measure, proportion.  
**Mässigkeit, mässig**—moderation, moderate, temperate.  
**Massivdecken**—reinforced concrete floors.  
**Mauer**—wall.  
**Mauerstein**—building stone.  
**Meer**—sea, ocean.  
**Meerwasser**—seawater.  
**mehr**—more.  
**meistens**—for the most part.  
**Melange**—mixture.  
**Menge**—quality, amount, abundance.  
**Mengungsverhältnis**—proportion of ingredients.  
**merkbar**—perceptible.  
**Merkblatt**—specification.  
**messbar**—measurable.  
**Methode**—Method.  
**Mineralbestandteil**—mineral (inorganic) constituent.  
**Mineralien**—minerals.  
**mischen**—mix, blend, adulterate.  
**Mischung**—mixture.  
**Mitteilung**—communication.  
**Molekül**—molecule.  
**Monat**—month.  
**Mörtel**—mortar.  
**mussieren**—effervesce.

## N

**nach der**—according to.  
**Nachbehandlung**—after treatment, curing.  
**Nachricht**—news, information.  
**nachstellen**—regulate.  
**Nacht**—night.  
**Nachteil**—disadvantage.  
**Nachtrag**—supplement, addendum.  
**Nachweisung**—detection, proof, identification.  
**Nachwirkung**—after effect, secondary effect.  
**nadelförmig**—needle shaped.  
**Nähe**—nearness, closeness.  
**namentlich**—namely, especially.  
**nassen**—wet, moisten.  
**Natriumsulfat**—sodium sulfate.  
**Natronwasserglas**—sodium silicate (water glass).  
**natürlich**—natural.  
**Nebeneinanderstellung**—juxtaposition, comparison.  
**neu**—new.  
**nennenswert**—noteworthy.  
**Neubearbeitung**—revision of work.  
**nicht**—not.  
**Nichtmetallisch**—non-metallic.  
**Niederschlag**—precipitate.  
**noch**—yet.  
**Norm**—standard.  
**Normblätter**—specifications.  
**normal**—normal, standard.  
**Normalbedingungen**—normal conditions.  
**notieren**—note.  
**notwendig**—necessary.  
**numerisch**—numerical.  
**nummer**—number.  
**nun**—now.  
**nunmehr**—at present, henceforth, by now.  
**nur**—only, scarcely, barely.  
**Nutzanwendung**—practical application.  
**nutzbar**—useful, of use.  
**nützlich**—useful, advantageous.

## O

**ob**—if, on account of.  
**oben**—above, overhead, on top.  
**obenhin**—superficially, slightly.

**Oberfläche**—surface, area.  
**Oberflächenwirkung**—surface action or effect.  
**Ofen**—oven, furnace, kiln.  
**offenbar**—manifest, obvious, plain.  
**oft**—often.  
**ohne**—without.  
**ordentlich**—ordinary, regular, exact.  
**ordinär**—ordinary.  
**Ordnung**—order, arrangement, class.  
**organisch**—organic.  
**Ortlichen**—local.  
**Oxyd**—oxide.  
**oxydieren**—oxidize.

## P

**Papier**—paper.  
**Partikel**—particle.  
**Patentschrift**—patent, patent specification.  
**perforieren**—perforate.  
**Pflaster**—plaster, pavement, paving.  
**Pflasterstein**—paving stone.  
**Pflasterziegel**—paving brick.  
**Porigkeit**—porosity.  
**Pozzolanerde**—Pozzolon.  
**Praktischen**—practical.  
**Präzipitat**—precipitate.  
**Princip**—principle.  
**Prozent**—percent.  
**Prozess**—process.  
**probieren**—test, assay.  
**produzieren**—produce.  
**Prüfung**—test.  
**Puddelschlacke**—puddling slag.  
**Pulver**—powder.

## Q

**Quellung**—swelling.  
**Querriss**—transverse crack.

## R

**Raumgehalt**—content by volume.  
**Raumveränderung**—change in volume.  
**Reagens**—reagent.  
**reaktionsfähig**—capable or reacting.  
**reaktionlos**—reactionless.  
**recht**—right.  
**Rechtfertigung**—justification.  
**reduzieren**—reduce.  
**Regel**—principle, rule, standard.  
**regelmässig**—regular, ordinary.  
**regeln**—regulate, order, arrange.  
**registrieren**—register, record.  
**reichhaltig**—abundant, plentiful.  
**Reinigung**—purification.  
**Reissfestigkeit**—tensile strength.  
**reparieren**—repair.  
**resultierend**—resulting.  
**richtig**—right, correct.  
**Richtlinien**—directions, instructions.  
**rissig**—cracked, fissured.  
**Rohschlacke**—raw slag.  
**rotieren**—rotate.  
**Rückschluss**—inference, conclusion.  
**Rücksicht**—regard, respect, attention, consideration.  
**ruhen**—rest.  
**rundweg**—plainly.

## S

**salinisch**—saline.  
**Salz**—salt.  
**Salzwirkung**—effect, (or action) of salt  
**Sand**—sand.  
**sandig**—sandy.  
**Sandstein**—sandstone.  
**Sättigung**—saturate.  
**Sättigungspunkt**—saturation point.  
**saturieren**—saturate.  
**sauermachend**—acidify.

Sauerstoff—oxygen.  
 säuerfest—acid proof.  
 Schade—damage, injury.  
 scharf—sharp, acrid, corrosive, severe.  
 Schaum—foam, froth.  
 Schaumschlacke—granulated slag.  
 schieben—shove, push.  
 Schlacke—slag.  
 Schlackenloch—slag notch.  
 Schlackenofen—slag furnace.  
 Schlackenstein—slag brick, building stone made of slag.  
 Schlackenwolle—slag wool.  
 Schlag—stroke, blow, percussion, shock.  
 Schlagempfindlichkeit—sensitivity to percussion.  
 Schleifmittel—abrasive.  
 Schleunig—speedy, hasty, quick.  
 schliessen—close, conclude.  
 Schluss—conclusion, end.  
 Schmelzbarkeit—fusibility.  
 Schmutz—dirt, filth.  
 schnell—fast, rapid, quick, sudden.  
 Schnellprobe—rapid test.  
 schon—already.  
 Schotter—broken stone, macadam.  
 Schutz—protection, shelter.  
 schwach—weak, feeble, faint, slight.  
 schwach-säuerlich—weakly acid.  
 Schwefel—sulfur.  
 schwefelartig—sulfurous.  
 Schwefelbestimmung—sulfur determination.  
 Schwefelkalzium—calcium sulfide.  
 schwefelsaur—salt of sulfate.  
 Schwefelsäure—sulfuric acid.  
 Schwefelwasserstoff—hydrogen sulfide.  
 Schwefligsäureanhydrid—sulfurous anhydride, sulfur dioxide.  
 Schwemmsteinen—concrete pumice block.  
 schwer—heavy, hard, severe.  
 Schwinden—shrinkage, contraction.  
 Schwindrisse—shrinkage cracks.  
 Seife—soap.  
 sein—be.  
 seine—its.  
 seit—since.  
 selbe—same.  
 selbst—self, even.  
 setzen—put, place, settle.  
 sicher—safe, secure, certain.  
 sichtbar—visible, evident.  
 Sieb—sieve.  
 Siedlung—settlement (group of dwellings).  
 Silikat—silicate.  
 Skelettaufbau—skeleton structure.  
 sogleich—at once.  
 solch, solche die—such, such as.  
 solvieren—dissolve.  
 somit—therefore, so.  
 Sonderabdruck—reprint.  
 sondern—but.  
 sortieren—sort, assort, size.  
 sowie—as well as, also.  
 Stadtrand-siedlung—suburban settlement.  
 Stahl—steel.  
 Standfestigkeit—stability.  
 stark—strong, powerful.  
 starren—rigid.  
 Staub—dust.  
 Stein—stone, rock.  
 Steinschlag—broken stone.  
 stellen—place, put, set.  
 Stoff—substance, matter, material.  
 Strasse—highway, street.  
 Strassenbau—road construction.  
 Strassenbauweisen—road construction methods.  
 Strassenoberbetons—concrete surface pavements.  
 Strassenunterhaltungs—road maintenance.  
 stückweise—piecemeal.

substituieren—substitute.  
 Sulfhydrat—hydrosulfide.  
 sulzig—gelatinous.

## T

Tafelsalz—table salt.  
 Tag—day.  
 tätig—active.  
 Tatsache—fact.  
 tauchen—dip, plunge, immerse.  
 Teer—tar.  
 Teerdecken—tar surfaces.  
 Teil—part, portion, diversion.  
 teilen—divide, share.  
 teilweise—partially.  
 Thomas-mehl—Thomas meal (ground basic slag).  
 tief—deep.  
 ton, tonartig—clay, clayey.  
 tragfähigkeit—bearing power.  
 trocken—dry.

## U

über—over, above, concerning.  
 überflüssig—in excess, abundant.  
 überführung—conversion.  
 Überlegung—consideration, deliberation.  
 übermässig—excessive.  
 übersichtlich—easily visible, clear.  
 um—about, in order to, to.  
 umkehrbar—reversible.  
 un—a prefix used like in English; un—to give a reverse meaning; also to denote immensity, i.e. deutlich means distinct; undeutlich, indistinct.  
 unten—below.  
 unter—under.  
 unterbettung—foundations.  
 untergrundes—subgrades, subsoil.  
 unterhaltung—maintenance.  
 Untersuchungsmittel—means of research or examination.  
 Untersuchung—research, investigation.

## V

verändlich—variable.  
 Verbesserung—improvement.  
 verbinden—combine, bind, join.  
 Verbindung—compound, combination.  
 Verbrauch—consumption, use.  
 verdünnen—dilute, rarefy.  
 verfahren—proceed, act, process, procedure.  
 verfassen—compose, write.  
 vergleichen—compare, agree.  
 Verhalten—behaviour.  
 Verhältniss—proportion, ratio.  
 Verhandlung—transaction, proceedings.  
 Verker—traffic.  
 Verkerlast—traffic load.  
 Verkleinerung—diminution, reduction.  
 Verlag—publication, publishing house.  
 verschieden—different, various.  
 verschlagen—warm, take chill off.  
 Versuch—research.  
 Versuchsanordnung—research procedure.  
 Versuchsausführung—test road.  
 Verwandlung—transformation.  
 Verwendung—utilization, use.  
 von—from, of, by.  
 Vorbildlicher—typical.  
 vorgang—procedure.  
 vorherig—preceding.  
 vorläufig—preliminary.  
 Vorschriften—specifications.  
 Vorstellung—conception, idea, introduction.

## W

wabenartig—honeycombed.  
 Wagen—wagon, vehicle.  
 während—during.  
 wahrlich—surely, truly, really.  
 Wandbewurf—plastering.  
 Wärme—heat.  
 Wasser—water.  
 Wasseraufnahme—absorption.  
 Wasserdampf—steam.  
 Wassergebundene—waterbound.  
 Wasserstrahl—water jet.  
 Wechsel—change, shifting, alteration.  
 wechselweise—alternately.  
 Weg—way, passage, route, street.  
 Wegebau—road building.  
 weich—soft.  
 weiter—farther, additional.  
 welcher—which, what, who.  
 Welt—world.  
 wenden—turn.  
 wenig—little.  
 wenn—when.  
 werden—shall, will, be, am, etc.  
 Werk—work.  
 Wert—value, valence.  
 Wesen—being, essence, substance, condition,  
 etc.  
 wesentlich—essential.  
 wichtig—important, weighty.  
 widerstandsfähig—resistant, refractory.  
 wie—how, as, like.  
 wieder—again.  
 wiegen—weigh.  
 wirken—work, act, have an effect.  
 Wirkung—action, effect, working operation.

Wirtschaftlichkeit—economy.  
 Wissenschaft—science, learning, knowledge.  
 Witterung—weathering.  
 Woche—week.  
 wohl—well.

## Z

Zähigkeit—toughness.  
 Zahl—number.  
 Zahlreichen—numerous.  
 Zählung—computation, calculation.  
 Zehnersteinen—hollow concrete blocks.  
 Zeichnung—drawing, diagram, sketch.  
 zeigen—show, exhibit.  
 Zeit—time.  
 Zelle—cell.  
 Zementgebundene—cement bound.  
 zementtieren—cement, bind.  
 zerfallen—disintegrate.  
 Zersetzung—disintegration.  
 zerstäuben—reduce to dust, pulverize.  
 Ziegel—brick, tile.  
 ziehen—pull, draw.  
 Zugabe—addition, supplement.  
 Zukunft—future.  
 zulassig—permissible.  
 zuletzt—at last, finally, last.  
 zum—on regarding.  
 zusammen—together.  
 Zusammenfassung—summary.  
 Zusammensetzung—composition.  
 Zusatz—admixture, supplement.  
 Zuschlag—flux.  
 Zweck—object, aim, purpose.  
 Zwecklos—useless, worthless.  
 zwingen—force, compel.  
 zwischen—between.

## APPENDIX IV

### AERONAUTIC SYMBOLS

#### I. FUNDAMENTAL AND DERIVED UNITS

	Symbol	Metric		English	
		Unit	Abbrevia- tion	Unit	Abbrevia- tion
Length.....	$l$	meter.....	m	foot (or mile).....	ft. (or mi.)
Time.....	$t$	second.....	s	second (or hour).....	sec. (or hr.)
Force.....	$F$	weight of 1 kilogram.....	kg	weight of 1 pound.....	lb.
Power.....	$P$	horsepower (metric).....		horsepower.....	hp.
Speed.....	$V$	(kilometers per hour).....	k.p.h.	miles per hour.....	m.p.h.
		(meters per second).....	m.p.s.	feet per second.....	f.p.s.

#### 2. GENERAL SYMBOLS

$W$ —Weight =  $mg$

$g$ —Standard acceleration of gravity =  $9.80665 \text{ m/s}^2$  or  $32.1740 \text{ ft./sec.}^2$

$m$ —Mass =  $\frac{W}{g}$

$I$ —Moment of inertia =  $mk^2$ . (Indicate axis of radius of gyration  $k$  by proper subscript.)

$\mu$ —Coefficient of viscosity

$\nu$ —Kinematic viscosity

$\rho$ —Density (mass per unit volume)

Standard density of dry air,  $0.12497 \text{ kg-m}^{-4}\text{-s}^2$  at  $15^\circ \text{ C.}$  and  $760 \text{ mm.}$ ;  
or  $0.002378 \text{ lb.-ft.}^{-4} \text{ sec.}^2$

Specific weight of "standard" air,  $1.2255 \text{ kg/m}^3$  or  $0.07651 \text{ lb./cu. ft.}$

#### 3. AERODYNAMIC SYMBOLS

$S$ —Area

$S_w$ —Area of wing

$G$ —Gap

$b$ —Span

$c$ —Chord

$\frac{b^2}{S}$ —Aspect ratio

$V$ —True air speed

$q$ —Dynamic pressure =  $\frac{1}{2}\rho V^2$

$L$ —Lift, absolute coefficient  $C_L = \frac{L}{qS}$

$D$ —Drag, absolute coefficient  $C_D = \frac{D}{qS}$

$D_o$ —Profile drag, absolute coefficient  $C_{D_o} = \frac{D_o}{qS}$

$D_i$ —Induced drag, absolute coefficient  $C_{Di} = \frac{D_i}{qS}$

$D_p$ —Parasite drag, absolute coefficient  $C_{Dp} = \frac{D_p}{qS}$

$C$ —Cross-wind force, absolute coefficient  $C_c = \frac{C}{qS}$

$R$ —Resultant force

$i_w$ —Angle of setting of wings (relative to thrust line)

$i_t$ —Angle of stabilizer setting (relative to thrust line)

$Q$ —Resultant moment

$\Omega$ —Resultant angular velocity

$\rho \frac{Vl}{\mu}$ —Reynolds Number, where  $l$  is a linear dimension (e.g., for a model airfoil 3 in. chord, 100 m.p.h. normal pressure at 15° C., the corresponding number is 234,000; or for a model of 10 cm chord, 40 m.p.s., the corresponding number is 274,000)

$C_p$ —Center-of-pressure coefficient (ratio of distance of c.p. from leading edge to chord length)

$\alpha$ —Angle of attack

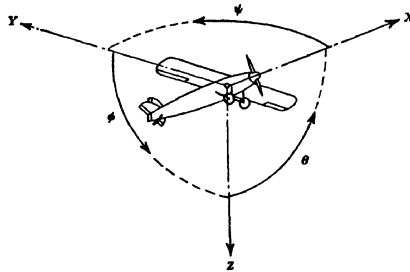
$\epsilon$ —Angle of downwash

$\alpha_o$ —Angle of attack, infinite aspect ratio

$\alpha_i$ —Angle of attack, induced

$\alpha_a$ —Angle of attack, absolute (measured from zero-lift position)

$\gamma$ —Flight-path angle



Positive directions of axes and angles (forces and moments) are shown by arrows

Axis			Moment about axis			Angle		Velocities	
Designation	Sym- bol	Force (parallel to axis) symbol	Designation	Sym- bol	Positive direction	Designa- tion	Sym- bol	Linear (compo- nent along axis)	Angular
Longitudinal.....	X	X	Rolling.....	L	Y → Z	Roll.....	$\phi$	u	p
Lateral.....	Y	Y	Pitching.....	M	Z → X	Pitch.....	$\theta$	v	q
Normal.....	Z	Z	Yawing.....	N	X → Y	Yaw.....	$\psi$	w	r

Absolute coefficients of moment

$$C_l = \frac{L}{qbS}$$

(rolling)

$$C_m = \frac{M}{qcS}$$

(pitching)

$$C_n = \frac{N}{qbS}$$

(yawing)

Angle of set of control surface (relative to neutral position),  $\delta$ . (Indicate surface by proper subscript.)

#### 4. PROPELLER SYMBOLS

$D$ —Diameter

$p$ —Geometric pitch

$p/D$ —Pitch ratio

$V'$ —Inflow velocity

$V_s$ —Slipstream velocity

$T$ —Thrust, absolute coefficient  $C_T = \frac{T}{\rho n^2 D^4}$

$Q$ —Torque, absolute coefficient  $C_Q = \frac{Q}{\rho n^2 D^5}$

$P$ —Power, absolute coefficient  $C_P = \frac{P}{\rho n^3 D^5}$

$C_s$ —Speed-power coefficient  $= \sqrt[5]{\frac{\rho V_s^5}{P n^2}}$

$\eta$ —Efficiency

$n$ —Revolutions per second, r.p.s.

$\Phi$ —Effective helix angle  $= \tan^{-1}\left(\frac{V}{2\pi r n}\right)$

#### 5. NUMERICAL RELATIONS

1 hp. = 76.04 kg-m/s = 550 ft-lb./sec.

1 metric horsepower = 1.0132 hp.

1 mph. = 0.4470 mps.

1 mps. = 2.2369 mph.

1 lb. = 0.4536 kg.

1 kg = 2.2046 lb.

1 mi. = 1,609.35 m = 5,280 ft.

1 m = 3.2808 ft.

# APPENDIX V

## SYMBOLS FOR HYDRAULICS

Published by courtesy of the American Standards Association

Acceleration	
in general .....	$a$
due to gravity.....	$g$
Area .....	$A$
Channel Flow	
area of section.....	$A$
average velocity in section.....	$V$
depth of flow.....	$d$
hydraulic radius .....	$R$
hydraulic slope .....	$S$
length .....	$L$
surface width .....	$B$
Kutter's coefficient of roughness.....	$n$
Bazin's coefficient of roughness.....	$m$
Chezy's coefficient .....	$C$
Coefficient	
of velocity .....	$c_v$
of contraction .....	$c_c$
of discharge .....	$c_d$
of roughness, Kutter's .....	$n$
of roughness, Bazin's .....	$m$
of Chezy .....	$C$
Density .....	$\rho$ (Rho)
Diameter .....	$D$
Energy per unit time (Power).....	$P$
Friction-factor used in expressing pipe-loss.....	$f$
Head	
in general .....	$h$ or $H$
elevation head .....	$z$
pressure head .....	$h_p$
velocity head .....	$h_v$
lost head .....	$h$ with appropriate subscript
Hydraulic Radius .....	$R$
Hydraulic Slope .....	$S$
Pressure	
intensity of .....	$p$
total pressure (Force) .....	$F$

## Pipes

average velocity in section.....	$V$
diameter of .....	$D$
head lost in .....	$h$ with appropriate subscript

hydraulic radius .....	$R$
hydraulic slope .....	$S$
length .....	$L$

Power (energy per unit time).....	$P$
-----------------------------------	-----

## Properties of water

density .....	$\rho$ (Rho)
bulk modulus of elasticity.....	$K$

Rate of discharge or flow (vol. per unit time)...	$Q$
---	-----

Slope, hydraulic .....	$S$
------------------------	-----

Time .....	$t$
------------	-----

## Velocity

absolute .....	$V$
relative to moving casing.....	$v$
of moving casing.....	$u$

## Viscosity

absolute .....	$\mu$ (Mu)
kinematic .....	$\nu$ (Nu)
(kinematic viscosity = absolute viscosity $\div$ density)	

## Weight

per unit volume.....	$w$
per unit time.....	$W$

## Weirs

head as measured.....	$H$ or $h$
velocity head of approach.....	$h_o$
crest height .....	$Z$
crest length .....	$B$
velocity of approach.....	$v_o$

## SYMBOLS RELATED TO HYDRAULIC TURBINES AND PUMPS

## SYMBOLS RELATING TO DIMENSIONS

Angle between the absolute velocity of the water and the velocity of the runner at any point, measured in degrees.....	$\alpha$ (Alpha)
Angle between the relative velocity of the water and the velocity of the runner at any point, measured in degrees.....	$\beta$ (Beta)
Axial breadth or depth of runner entrance....	$B$
Diameter of runner or impeller.....	$D$

Diameter of runner or impeller vanes at the middle of entrance space.....	$D_1$
Diameter of runner or impeller throat (inside diameter of band or shroud ring).....	$D_{th}$
Radius to any point from center of runner or impeller .....	$r$

**SYMBOLS RELATING TO EFFICIENCY**

Hydraulic .....	$e_h$
Mechanical .....	$e_m$
Total or overall.....	$e$

**SYMBOLS RELATING TO HEAD**

Total head at any point.....	$H$
Potential head at any point.....	$z$
Pressure head at any point.....	$h_p$
Velocity head at any point.....	$h_v$
$(H = h_v + h_p + z)$	

**SYMBOLS RELATING TO POWER**

Power, or energy per unit time.....	$P$
Power of turbine under 1-foot head.....	$P_1$
Power at brake.....	$P_B$
Power from water.....	$P_w$

Note: Where power is to be expressed in horsepower or other units, statement to that effect should be made.

**SYMBOLS RELATING TO SPEED**

Revolutions per minute.....	$n$
Revolutions per minute under 1-foot head.....	$n_1$
Specific speed or type characteristic.....	$n_3$

$$n_3 = \frac{n\sqrt{P}}{H^{5/4}}$$

$P$  being expressed in horsepower

Ratio of peripheral speed of runner to  $\sqrt{2gH}$   $\phi$  (Phi)

$$\phi = \frac{u_1}{\sqrt{2gH}}$$

**SYMBOLS RELATING TO VELOCITY**

Angular velocity, in radians per second.....	$\omega$ (Omega)
Absolute velocity of the water at any point in a rotating runner or impeller.....	$V$
Circumferential velocity of a point on a rotating runner or impeller.....	$u$
Circumferential or tangential component of the absolute velocity of the water.....	$V_u$

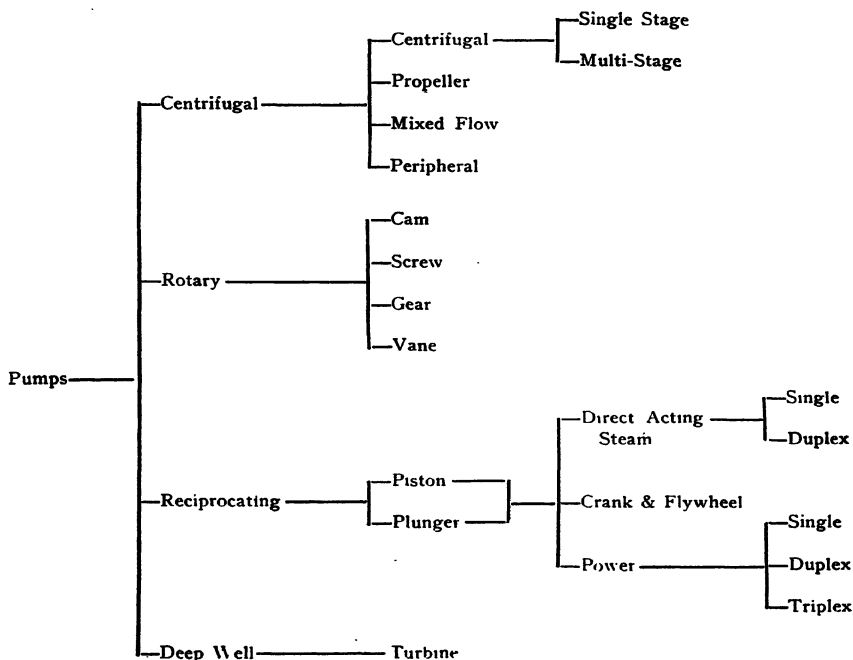
Meridional component of the absolute velocity of the water (component in the plane containing the axis of rotation of runner or impeller)	$V_m$
Radial component of the absolute velocity of the water .....	$V_r$
Relative velocity of the water with respect to the moving runner or impeller.....	$v$

Notes: (1) Subscripts 1 and 2 may be used to refer to the points of entrance and discharge in either a runner or impeller, the assumption being that the water always flows from point (1) to point (2). Thus  $V^1$  and  $V^2$  refer to the absolute velocity of the water at entrance and exit from a runner or impeller. (2) The German standard symbols for absolute, relative and circumferential velocities are  $c$ ,  $w$  and  $u$ , and  $v$  (Gamma) is used for unit weight. The large amount of German literature on the subject of turbines warrants the statement here of these facts.

## PUMPS—STANDARD CLASSIFICATION

Published by courtesy of the Hydraulic Institute

Pumping machinery in the Standards of the Hydraulic Institute is divided into four general classes. Each class is subdivided into types, differing in the design of the details, but having features that are common to that type. It is to the best interest of prospective purchasers and consulting engineers, when preparing specifications of pumping machinery, to consider the standard classification as applying to type only, leaving the manufacturer free to use such details as he has developed and standardized for that type of pump.



## MATERIALS FOR PUMPING VARIOUS LIQUIDS

Published by courtesy of the Hydraulic Institute

This list has been compiled for the convenience of pump manufacturers and pump users, and represents the best known practice within the experience of the Institute, based on materials readily available to 1936.

**G-47—Explanations of Table.** In compiling this list of materials, trade names are avoided as far as possible. The very costly materials, or materials that are not readily available to several or all pump manufacturers, are only listed where the special or severe corrosive and/or

Liquid	Condition	Chemical Symbol	Specific Gravity	Wt. in lbs. per Gal.	Materials Permissible Numbers refer to G-48
Acid, Acetic	Conc.	CH <sub>3</sub> COOH	1.055	8.79	Aluminum Bronze, Monel 4, 5
Acid, Acetic	Dil.				Bronze Monel 3, 4, 5
Acid, Arsenic		As <sub>2</sub> O <sub>5</sub>			All Iron 3, 4, 5
Acid, Benzoic		C <sub>6</sub> H <sub>5</sub> COOH			3, 4, 5
Acid, Boric					Aluminum Brz., Monel 3, 4, 5
Acid, Butyric	Conc.	CH <sub>3</sub> (CH <sub>2</sub> ) <sub>3</sub> CO <sub>2</sub> H	.96	8.00	3, 4, 5
Acid, Carbolic	Conc. (M.P. 105° F)	C <sub>6</sub> H <sub>5</sub> OH	1.071	8.93	All Iron
Acid, Carbolic in H <sub>2</sub> O					Standard Fitted
Acid, Carbonic in H <sub>2</sub> O					All Bronze
Acid, Chromic in H <sub>2</sub> O	pH < 4.5	CrO <sub>3</sub> +H <sub>2</sub> O			3, 4, 5
Acid, Citric (Hydrate)		CrO <sub>3</sub> +H <sub>2</sub> O			3, 4, 5
Acids, Fatty (Oleic, Palmitic & Steiric)		C <sub>6</sub> H <sub>5</sub> O <sub>2</sub> +H <sub>2</sub> O	1.54	12.83	Aluminum Bronze, Monel 4, 5
Acid, Formic		HCOOH	1.2	10.00	4, 5
Acids, Fruit					Monel 3, 4, 5
Acid, Hydrochloric	Com'l Conc.	HCl	1.16(20° Be°)	9.67	Hastelloy, High Silicon Iron, Stone Ware
Acid, Hydrochloric	Dil. (1-10%)	HCl			Hastelloy, High Silicon Iron, Stone Ware
Acid, Hydrochloric	Cold	HCl			As above & Non-Metallic
Acid, Hydrocyanic		HCN	0.70	5.84	All Iron
Acid, Hydrofluosilicic		H <sub>2</sub> SiF <sub>6</sub>			Aluminum Bronze, Monel
Acid, Mine Water (Coal)					High Lead Bronze 2, 3, 4, 5
Acid, Mixed					4, 5
Acid, Muriatic	See Acid Hydrochloric				
Acid, Napthenic					3, 4, 5
Acid, Nitric	Cons. Boiling	HNO <sub>3</sub>	1.41	11.75	1, 2, 3, 4, 5
Acid, Nitric	Dilute				1, 2, 3, 4, 5
Acid, Oxalic	To 50%	CO <sub>2</sub> CHO <sub>2</sub> H <sub>2</sub> H <sub>2</sub> O			5, High Silicon Iron
Acid, Phosphoric	Crude 50%	H <sub>3</sub> PO <sub>4</sub>	1.36-1.4	11.3-11.7	4, 5
Acid, Picric					3, 4, 5 High Silicon Iron
Acid, Pyrogallic					3, 4, 5
Acid, Pyroligneous		H <sub>2</sub> C <sub>2</sub> H <sub>3</sub> O <sub>2</sub>	1.018-1.03		All Bronze 3, 4, 5
Acid, Sulphuric, 93%	66° Be° Cold	H <sub>2</sub> SO <sub>4</sub>	1.835-	15.50	All Iron, 5, High Silicon Iron
Acid, Sulphuric	Boiling	H <sub>2</sub> SO <sub>4</sub>			High Silicon Iron
Acid, Sulphuric	To 50%	H <sub>2</sub> SO <sub>4</sub>			Lead, 5, High Silicon Iron
Acid, Sulphuric	10%	H <sub>2</sub> SO <sub>4</sub>	1.07	9.9	Sil. Bronze, Alum. Brz., Lead, Monel, 5, High Sil. Ir.
Acid, Sulphuric (Oleum)	Fuming	H <sub>2</sub> SO <sub>4</sub> +SO <sub>3</sub>			Steel
Acid, Sulfurous		H <sub>2</sub> SO <sub>3</sub>			Lead, "Sulphite Bronze," Alum Brz. 4, 5
Acid, Tannic		C <sub>12</sub> H <sub>10</sub> O <sub>6</sub>			All Bronze, Monel 3, 4, 5
Acid, Tartaric		C <sub>4</sub> H <sub>4</sub> (OH) <sub>2</sub> (COOH) <sub>2</sub>			3, 4, 5
Acetone		CH <sub>3</sub> COC <sub>2</sub> H <sub>5</sub>	0.79	6.62	All Iron
Alcohol (Grain)		C <sub>2</sub> H <sub>5</sub> OH	0.7939	6.62	All Bronze, St'd. Fitted
Alcohol (Wood)		CH <sub>3</sub> OH	0.7965	6.64	All Bronze, St'd. Fitted
Aluminum Sulphate (Alum)	Containing Water & Acid	N <sub>2</sub> (SO <sub>4</sub> ) <sub>3</sub>			Lead High Silicon Iron, 5
Ammonia, Aqua		NH <sub>4</sub> OH			All Iron
Ammonium Bicarbonate	Aqueous Sol.	NH <sub>4</sub> HCO <sub>3</sub>			All Iron

abrasive conditions seem to warrant their mention; i.e.; High-Silicon Irons, Hastelloy and non-metallic materials.

When the liquid to be pumped may act as an electrolyte, a construction involving dissimilar metals is avoided, viz; Sea Water does not attack cast iron rapidly and has little effect on bronzes, but the action on cast iron is greatly accelerated by contact with bronze when both metals are submerged in sea water. Serious graphitization has been known to occur on cast iron parts in a standard fitted pump handling salt brines and sea water. In spite of the fact that thousands of stand-

Liquid	Condition	Chemical Symbol	Specific Gravity	Wt. in lbs. per Gal.	Materials Permissible—See G-47 Numbers refer to G-48
Ammonium Chloride	Aqueous Sol.	NH <sub>4</sub> Cl			All Iron 4, 5
Ammonium Nitrate	Aqueous Sol.	NH <sub>4</sub> NO <sub>3</sub>			All Iron 3, 4, 5
Ammonium Phosphate	Aqueous Sol.	(NH <sub>4</sub> ) <sub>2</sub> HPO <sub>4</sub>			All Iron 3, 4, 5
Ammonium Sulfate	Aqueous Sol.	(NH <sub>4</sub> ) <sub>2</sub> SO <sub>4</sub>			All Iron 3, 4, 5
Ammonium Sulfate	With H <sub>2</sub> SO <sub>4</sub>				Lead, All Bronze, 5
Aniline		C <sub>6</sub> H <sub>5</sub> NH <sub>2</sub>			All Iron
Aniline Hydrochloride	Aqueous Sol.	C <sub>6</sub> H <sub>5</sub> NH <sub>2</sub> ·HCl			High Silicon Iron
Asphaltum	Hot		0.98-1.4	8.16-11.65	All Iron
Barium Chloride		Ba Cl <sub>2</sub>			All Iron 4, 5
Barium Nitrate		Ba(NO <sub>3</sub> ) <sub>2</sub>			All Iron 3, 4, 5
Beer					All Bronze 3, 4, 5
Beer Wort					All Bronze 3, 4, 5
Beet Juice (Thin)					All Bronze 3, 4, 5
Benzene (Benzol)		C <sub>6</sub> H <sub>6</sub>	0.88	7.32	All Iron
Benzene			0.64-0.66	5.33-5.49	Bronze Fitted
Bichloride of Mercury	(See Mercuric Chloride)				
Bitterwässer					All Bronze, 3
Bleach Solutions	(See type)				
Brine, Calcium Chloride	Aqueous Sol.	CaCl <sub>2</sub>			All Iron*
Brine, Calcium & Sodium Chloride					All Bronze, 3
Brine, Sodium Chloride	3% Salt	Na Cl	1.02	8.50	All Iron*, All Bronze, 3
Brine, Sodium Chloride	Over 3%		1.02-1.20	8.49-10	All Bronze, Monel, 3, 4, 5
Brine, Sea Water					All Iron*, All Bronze, 3
Cachaza					Bronze Fitted
Cadmium Electrolyte					5, High Silicon Iron, Non-Metallic
Calcium Bisulfite	Digester Press	Ca(HSO <sub>3</sub> ) <sub>2</sub>	1.04	8.67	4, 5
Calcium Chlorate	Aqueous Sol.	Ca(ClO <sub>3</sub> ) <sub>2</sub> ·2H <sub>2</sub> O			3, 4, 5
Calcium Hypochlorite		Ca(OCl) <sub>2</sub>			All Iron, 5, High Silicon Iron
Calcium Magnesium Chloride					All Bronze
Cane Juice					Bronze Fitted
Carbon Bisulfide		CS <sub>2</sub>			All Iron
Carbonate of Soda	(See Soda Ash)				
Carbon Tetrachloride		CCl <sub>4</sub>	1.58	13.15	All Iron, Plus Water—Bronze 5
Caustic Potash	(See Potassium Hydroxide)				
Caustic Soda	(See Sodium Hydroxide)				
Cellulose Acetate					4, 5 High Silicon Iron
Chlorate of Lime	(See Calcium Chlorate)				
Chloride of Lime	(See Calcium Hypochlorite)				
Chlorine Water					Hastelloy C, High-Sil. Iron, Non-Metallic
Chlorobenzene		C <sub>6</sub> H <sub>5</sub> Cl	1.1	9.22	St'd. Fitted, 3
Chloroform		CHCl <sub>3</sub>	1.5	12.5	Lead, 3, 4, 5
Chrome Alum	Aqueous Sol.	K <sub>2</sub> SO <sub>4</sub> ·Cr <sub>2</sub> (SO <sub>4</sub> ) <sub>3</sub> ·24H <sub>2</sub> O			5, High Silicon Iron
Copperas (Green Vitriol)	(See Ferrous Sulfate)				
Copper Acetate	Aqueous Sol.	Ca(C <sub>2</sub> H <sub>3</sub> O <sub>2</sub> ) <sub>2</sub>			4, 5
Copper Chloride	Aqueous Sol.	Cu Cl <sub>2</sub>			High-Silicon Iron Hastelloy C, Non-Metallic
Copper Nitrate		Cu(NO <sub>3</sub> ) <sub>2</sub>			3, 4, 5
Copper Sulfate, Blue Vitriol	Aqueous Sol.	CuSO <sub>4</sub>			Lead 3, 4, 5, High Sil. Iron

ard fitted pumps are used for this service, it is thought that the Institute should recognize the possibility of serious electrolytic (galvanic) action and cease to definitely recommend pumps containing metals widely separated in the electro-chemical series, for handling aqueous solutions that may act as an electrolyte.

Under the column "Conditions" where the space is left blank, it is assumed that the material recommended is suitable for the usual ranges of concentration and for both cold and hot (175° F.) solutions.

Alternate materials for the lower cost "standard" metals are fre-

Liquid	Condition	Chemical Symbol	Specific Gravity	Wt. in lbs. per Gal.	Materials Permissible—See G-47 Numbers refer to G-48
Creosote			0.93	7.75	All Iron
Cresol, Meta		$\text{CH}_3\text{C}_6\text{H}_4\text{OH}$	1.04	8.67	All Iron
Cyanide (See Sodium Cyanide and Potassium Cyanide)					All Iron
Cyanogen	In Water	$\text{C}_2\text{N}_2(\text{Gas})$			All Iron
Diphenyl	In Alcohol	$\text{C}_6\text{H}_5\text{C}_6\text{H}_5$			All Iron
Ethyl Acetate		$\text{CH}_3\text{COOC}_2\text{H}_5$	0.9	7.50	All Iron 4, 5
Ethylene Chloride	Cold	$\text{C}_2\text{H}_4(\text{Cl})_2$	1.28	10.63	Lead, 5, High Silicon Iron
Ferric Chloride	Aqueous Sol.	$\text{Fe Cl}_3$			High Sil. Iron, Hastelloy C, Non-Metallic
Ferric Chloride	Hot	$\text{Fe Cl}_3$			Hastelloy C, Spl. High Sil. Iron, Silver, Non-Metallic
Ferric Sulphate	Aqueous Sol.	$\text{Fe}_2(\text{SO}_4)_3$			5, High Silicon Iron
Ferrous Chloride	Cold Aqueous	$\text{Fe Cl}_2$			All Iron (Oxidizes to Ferric Conditions Readily)
Ferrous Sulphate (Copperas)	Aqueous Sol.	$\text{Fe SO}_4$			All Iron, Lead, 5, High Silicon Iron
Formaldehyde		$\text{HCOH}$	1.075-1.081	8.96-9.01	3, 4, 5
Fruit Juices					3, 4, 5, Monel, High Sil. Iron
Furfural		$\text{C}_4\text{H}_2\text{OCHO}$	1.16	9.67	All Iron 3, 4, 5
Gasolene		$\text{C}_8\text{H}_{18}$	.68-0.75	5.66-6.25	Bronze Fitted
Glaubers Salt	(See Sodium Sulfate)				
Glue	Hot				Bronze Fitted
Glycerol (Glycerin)	Dynamite	$\text{C}_3\text{H}_7(\text{OH})_3$	1.262	10.52	All Bronze, 3
Heptane		$\text{C}_7\text{H}_{16}$	0.69	5.77	Bronze Fitted
Hydrogen Peroxide	Com'l	$\text{H}_2\text{O}_2$			All Iron, 3, 4, 5
Hydrogen Sulfide	Aqueous Sol.				
Hydrosulfite	In Water	$\text{H}_2\text{S}$			Ni-Resist, 3, 4, 5
Hyposulfite of Soda	(See Sodium Hydrosulfite)				
Lard	(See Sodium Thiosulfate)				
Lead Acetate (Sugar of Lead)	Hot				All Iron
Lead Molten	Aqueous Sol.	$\text{Pb}(\text{C}_2\text{H}_3\text{O}_2)_2$			3, 4, 5 High Silicon Iron
Lime Water (Milk of Lime)		$3\text{H}_2\text{O}$			
Lye, Caustic		$\text{Ca}(\text{OH})_2$			All Iron
Magnesium Chloride	(See Potassium & Sodium Hydroxide)				All Iron
Magnesium Sulfate (Epsom Salts)	Aqueous Sol.	$\text{Mg Cl}_2$			Lead, High Silicon Iron, 5 (Cold)
Magma (Thick Residue)	Aqueous Sol.	$\text{Mg SO}_4$			All Iron, 3
Manganese Chloride	Aqueous Sol.	$\text{Mn Cl}_2$			All Bronze, 3
Manganous Sulfate	Aqueous Sol.	$\text{Mn SO}_4\cdot\text{H}_2\text{O}$			All Bronze, 3, 4, 5
Mash					All Iron, All Bronze, 3, 4, 5
Mercuric Chloride	Very Dilute	$\text{Hg Cl}_2$			Bronze Fitted, All Bronze, 3, 4, 5, High Silicon Iron
Mercuric Chloride	Aqueous Sol.	$\text{Hg Cl}_2$			
Mercuric Chloride	Com'l Conc.	$\text{Hg Cl}_2$			High Silicon Iron, Hastelloy C, Stoneware
Mercuric Sulfate	In $\text{H}_2\text{SO}_4$	$\text{Hg SO}_4$			High Silicon Iron, Stoneware
Mercurous Sulfate	In $\text{H}_2\text{SO}_4$	$\text{H}_2(\text{SO}_4)_2$			High Silicon Iron, Stoneware
Methyl Acetate		$\text{CH}_3\text{CO}_2\text{CH}_3$	0.924	7.7	4, 5
Methyl Chloride		$\text{CH}_3\text{Cl}$	.92	7.66	All Iron
Methylene Chloride		$\text{CH}_2\text{Cl}_2$	1.26	10.5	All Iron, 3
Milk			1.028-1.035	8.55-8.62	Bronze Tinned, 3
Milk of Lime	(See Lime Water)				
Mine Water	(See Acid Mine Water)				

quently mentioned due to special conditions that may be encountered. Thus, the standard pump materials (cast iron or bronze) may not be seriously affected by the liquid, but for some processes the liquid may be adversely affected by the small amount of metal salts going into solution, particularly during shut down periods when the pump is not washed out. This situation might cause the reduction of the liquid inside the pump (i.e.; Bronzes will reduce hydrogen peroxide and sodium hypochlorite bleach solutions), might affect the color of the product, or might cause the introduction of toxic metal salts into a food product.

Liquid	Condition	Chemical Symbol	Specific Gravity	Wt. in lbs. per Gal.	Materials Permissible—See G-47 Numbers refer to G-48
Molasses	Low P.H. Solutions  (See Potassium Nitrate) (See Sodium Bisulphate) Hot Cold	$\text{CNH}_2\text{N}+2$  $\text{Ni. Cl}_2$ $\text{Ni. SO}_4$ $\text{C}_{10}\text{H}_{16}\text{N}_4\text{H}_2\text{SO}_4$	0.665	5.54	Bronze Fitted
Mustard					All Bronze, 3
Naphtha					Bronze Fitted
Naphtha, Crude					St'd. Fitted
Nickel Chloride }					5, High Silicon Iron
Nickel Sulfate }					
Nicotine Sulfate					5, High Silicon Iron
Nitre					
Nitre Cake					
Oil, Crude (Asphalt Base)					St'd. Fitted
Oil Crude (Paraffine Base)					St'd. Fitted
Oil, Fuel					St'd. Fitted
Oil, Kerosene					St'd. Fitted
Oil, Lubricating (Lt. or Hy)					St'd. Fitted
Oil, Mineral					All Iron
Oil, Vegetable	All Iron				
Oil, Purifying	All Iron				
Oil, Coal Tar	All Iron				
Oil, Creosote	All Iron				
Oil, Turpentine	All Iron				
Oil, Linseed	All Iron, 3, Monel				
Oil, Rapeseed	All Bronze, 3, Monel				
Paraffine	Bronze Fitted				
Perhydrol	Hot				
Peroxide of Hydrogen	(See Hydrogen Peroxide)				
Petroleum Ether	(See Hydrogen Peroxide)				
Phenol	(See Benzine)				
Photographic Developers	(See Carbolic Acid)				3, 4, 5, High Silicon Iron, Non-Metallic
Potash	(See Potassium Carbonate)				
Potassium Bichromate	Aqueous Sol.	$\text{K}_2\text{Cr}_2\text{O}_7$			All Iron
Potassium Carbonate	Aqueous Sol.	$\text{K}_2\text{CO}_3$			All Iron
Potassium Chlorate	Aqueous Sol.	$\text{KClO}_3$			All Iron, 3, 4, 5
Potassium Chloride	Aqueous Sol.	$\text{KCl}$			All Bronze, 3, 4, 5
Potassium Cyanide	Aqueous Sol.	$\text{KCN}$			All Iron
Potassium Hydroxide	Aqueous Sol.	$\text{KOH}$			All Iron 1, 3, 4, 5
Potassium Nitrate	Aqueous Sol.	$\text{KNO}_3$			All Iron 1, 3, 4, 5
Potassium Sulfate	Aqueous Sol.	$\text{K}_2\text{SO}_4$			All Iron, All Bronze, 3, 4, 5
Pyridine		$\text{CH}(\text{CH}_3)_3\text{N}$	975	8.13	All Iron
Rectifying Pump (Distillery)					All Bronze
Rhigolene (Oil Dist.)					Bronze Fitted
Salammoniac	(See Ammonium Chloride)				
Salt Cake	Aqueous Sol.	$\text{Na}_2\text{SO}_4$ + impurities			All Iron, All Bronze, 3, 4, 5
Salt Water	(See Brines)				
Sea Water	(See Brines)				
Sewage					Bronze Fitted
Silver Nitrate		$\text{AgNO}_3$			3, 4, 5 High Silicon Iron
Slop, Brewery					Bronze Fitted
Soap Liquor	Thin				All Iron
Soda Ash (Sodium Carbonate)	Aqueous Sol.	$\text{Na}_2\text{CO}_3$			All Iron

Some plants prefer to use cheap pumps and replace them frequently, particularly during the experimental period of a process, while other plants with stabilized processes require pumps that will give many years of trouble-free service. Where these conditions are known to exist in the pumping of some corrosive liquids, the alternate materials mentioned permit a better selection for the local conditions existing.

Alternate materials to cast iron and/or bronze are also mentioned

Liquid	Condition	Chemical Symbol	Specific Gravity	Wt. in lbs. per Gal.	Materials Permissible—See G-47 Numbers refer to G-48
Sodium Bicarbonate	Aqueous Sol. (See brines)	Na HCO <sub>3</sub>			All Iron, 3
Sodium Bisulfate		Na HSO <sub>4</sub>			5, High Silicon Iron, Lead
Sodium Chloride					
Sodium Cyanide		Na CN			All Iron, 3, 4, 5
Sodium Hydroxide		Na OH			All Iron, 3, 4, 5
Sodium Hydrosulfite		Na <sub>2</sub> S <sub>2</sub> O <sub>4</sub>			Lead, 3, 4, 5
Sodium Hypochlorite		Na OCl			5, High Sil. Iron, Lead, Non-Metallic
Sodium Hyposulfite	(See Sodium Thiosulfate)				
Sodium Nitrate	Aqueous Sol.	Na. NO <sub>3</sub>			All Iron, 1, 3
Sodium Sulfate	Aqueous Sol.	Na <sub>2</sub> SO <sub>4</sub>			All Iron
Sodium Sulfide	Aqueous Sol.	Na <sub>2</sub> S			All Iron, All Bronze, Lead, 3, 4, 5
Sodium Sulfite	Aqueous Sol.	Na <sub>2</sub> SO <sub>3</sub>			All Bronze, Lead, 3, 4, 5
Sodium Thiosulfate	Aqueous Sol.	Na <sub>2</sub> S <sub>2</sub> O <sub>5</sub> ·5H <sub>2</sub> O			3, 4, 5 Monel High Sil. Iron, Lead, Non-Metallic
Stannic Chloride	Aqueous Sol.	Sn Cl <sub>4</sub>			High Sil. Iron, Hastelloy C. Non-Metallic
Stannous Chloride	Aqueous Sol.	Sn Cl <sub>2</sub>			High Sil. Iron, Hastelloy C. Non-Metallic
Starch	Aqueous Sol.	C <sub>6</sub> H <sub>10</sub> O <sub>5</sub>			Bronze Fitted
Strontium Nitrate		Sr(NO <sub>3</sub> ) <sub>2</sub>			All Iron, 3
Sugar					All Bronze
Sulfite Liquors					Sulfite Bronze, 4, 5
Sulfur	In Water	S			All Iron, Ni-Resist, All Bronze
Sulfur Chloride	Cold	S <sub>2</sub> Cl <sub>2</sub>			All Iron, Lead
Syrup					All Bronze
Tanning Liquors (Veg.)					All Bronze, 3
Tar					All Iron
Tar & Ammonia	Aqueous Sol.				All Iron
Tetrachloride of Tin	(See Stannic Chloride)				
Tetraethyl Lead		Pb(C <sub>2</sub> H <sub>5</sub> ) <sub>4</sub>	1.65	13.76	All Iron
Toluene (Toluol)		CH <sub>3</sub> C <sub>6</sub> H <sub>5</sub>	0.86	7.16	All Iron, St'd. Fitted
Trichloroethylene		C <sub>2</sub> HCl <sub>3</sub>	1.47	12.25	All Iron
Urine					All Bronze, 3
Varnish					All Bronze, Monel
Vinegar					All Bronze, 3, 4, 5, High Silicon Iron
Vitriol, Blue	(See Copper Sulfate)				
Vitriol, Green	(See Ferrous Sulfate)				
Vitriol, Oil of	(See Acid, Sulfuric)				
Vitriol, White	(See Zinc Sulfate)				
Water, Distilled			1.00	8.337	Bronze Fitted
Water, Fresh			1.00	8.337	Bronze Fitted
Water, Salt & Sea	(See Brines)				
Whiskey					All Bronze, 3
Wine					All Bronze, 3
Wood Pulp	Not Digested				Bronze Fitted
Wood Vinegar	(See Pyrohgneous Acid)				
Wort					All Bronze
Yeast					All Bronze or Bronze Fitted
Zinc Chloride	Aqueous Sol.				Spl. Bronze, Alum. Bronze, 4, 5, High Sil. Iron
Zinc Electrolyte					Lead, High Silicon Iron, 5.
Zinc Sulfate	Aqueous Sol.				All Bronze, 3, 4, 5 High Sil. Iron

\*The use of 12-14% Chromium Steel Impellers and Shafts and 12-14% Chromium Steel Wearing Rings and Shaft Sleeves, hardened, is permissible in All Iron pumps without serious galvanic action. Such parts will give much longer life than Cast Iron.

for various liquids, which liquids, if pure, may be handled safely in the standard low cost metals, but which are very frequently pumped in an impure or crude condition. Thus, many of the sulfate solutions will not attack cast iron, but these sulfate solutions are frequently

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#### G-48 CORROSION—RESISTING STEEL ALLOYS CLASSIFICATION

Type Number	Approximate Cr	Analysis Ni	% — C*	Si, Mn, P, S, are in all types	Mo	Fe	Other permissible Elements
No. 1	17-20	0	.12 Max.	0	80-83		
No. 2	28-30	0	.15 Max.	0	70-72		
No. 3	17-19	7-9	.07 Max.	0	81-83		
No. 4	17-19	7-9	.07 Max.	3-4	68-73	Ti	
No. 5	18-20	22-60	.07 Max.	1-4	16-59	Ti, Cb, W, Cu	

\*Low carbon alloys, only, are recommended to insure protection from such failures as "inter-crystalline-corrosion" or "intergranular-attack."

The order of listing the materials does not indicate a preference. The higher price alloys may last longer, but at the same time may not be as economical as a lower cost material.

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pumped when they are not completely neutralized, and thus contain some free acid, or other corrosive impurities.

There are now so many corrosion resisting steels used for pump construction, that an attempt has been made to classify these in the better known analyses or types. The number assigned to the following classifications from 1 to 5 indicate an increasing resistance to corrosion, in most corrosive solutions, and an increasing cost. It does not always follow, however, that a pump constructed of No. 5 type alloy will cost more than a pump of No. 3 type alloy, because a pump manufacturer may have standardized on the more costly alloy and thus may build pumps of the better and more costly alloy for a lower cost than a single pump of the cheaper metal.

## APPENDIX VI

### ABBREVIATIONS FOR SCIENTIFIC AND ENGINEERING TERMS

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1.—The Executive Committee of the Sectional Committee on Scientific and Engineering Symbols and Abbreviations has made the following distinction between symbols and abbreviations: A symbol is a letter or sign used in a formula as a substitute for any numerical value. A shortened expression for a name or a unit is an abbreviation and not a symbol.

#### FUNDAMENTAL RULES

2.—Abbreviations should be used sparingly in text and with regard to the context and to the training of the reader. Terms denoting units of measurement should be abbreviated in the text only when preceded by the amounts indicated in numerals; thus "several inches," "one inch," "12 in." In tabular matter, specifications, maps, drawings, and texts for special purposes, the use of abbreviations should be governed only by the desirability of conserving space.

3.—A sentence should not begin with a numeral followed by an abbreviation.

4.—Short words such as ton, day, and mile should be spelled out.

5.—Abbreviations should not be used where the meaning will not be clear. In case of doubt, spell out.

6.—The use of conventional signs for abbreviations in text is not recommended; thus "per," not /; "lb.," not #; "in.," not ". Such signs may be used sparingly in tables and similar places for conserving space.

7.—The Committee endorses the movement which was begun by the International Committee on Weights and Measures in omitting the period in abbreviations of metric units and further endorses the growing tendency toward the omission in abbreviations of other origin. In the interests of economy and the reduction of waste the elimination of the period is recommended except where such an omission results in an English word. Exceptions to this practice will be found in a few mathematical and chemical terms, such as sin, tan, log, As, etc.

8.—The letters of such abbreviations as A.S.M.E. should not be spaced (not A. S. M. E.)

9.—The use in text of exponents for the abbreviations of square and cube and of the negative exponents for terms involving "per" is not recommended. The superior figures are usually not available on the keyboards of typesetting and linotype machines and composition is therefore delayed. There is also the likelihood of confusion with footnote reference numbers. These shorter forms are permissible in tables and are sometimes difficult to avoid in text.

## ABBREVIATIONS

In this initial list of Abbreviations for Scientific and Engineering Terms only those most commonly used have been included. These forms are recommended for readers whose familiarity with the terms used makes possible a maximum of abbreviations. For other classes of readers editors may wish to use less contracted combinations made up from this list. For example, the list gives the abbreviation of the term "feet per second" as "fps." To some readers ft per sec will be more easily understood.

Absolute .....	abs	Centigram .....	cg
Acre .....	acre	Centiliter .....	cl
Acre-foot .....	acre-ft	Centimeter .....	cm
Air horsepower .....	air hp	Centimeter-gram-second (sys-	
Alternating-current (as adjec-		tem) .....	cgs
tive) .....	a-c	Cent .....	c or ¢
Ampere .....	amp	Chemical .....	chem
Ampere-hour .....	amp-hr	Chemically pure .....	cp
Angstrom unit .....	Å	Circular .....	cir
Antilogarithm .....	antilog	Circular mils .....	cir mils
Atomic weight .....	at. wt	Coefficient .....	coef
Atmosphere .....	atm	Cologarithm .....	colog
Average .....	avg	Concentrate .....	conc
Avoirdupois .....	avdp	Conductivity .....	cond
Barometer .....	bar.	Constant .....	const
Barrel .....	bbl	Continental horsepower...cont hp	
Baumé .....	Bé	Cord .....	cd
Board feet (feet board mea-		Cosecant .....	csc
sure) .....	fbm	Cosine .....	cos
Boiler pressure .....	bp	Cost, insurance, and freight...cif	
Boiling point .....	bp	Cotangent .....	ctn
Brake horsepower .....	bhp	Coulomb .....	spell out
Brake horsepower-hour ...bhp-hr		Counter electromotive force...	
Brinell hardness number....Bhn		.....counter emf	
British thermal unit...Btu or B†		Cubic .....	cu
Bushel .....	bu	Cubic centimeter—cu cm, cm <sup>3</sup> , cc	
Calory .....	cal	(liquid meaning milliliter, ml)	
Candle .....	c	Cubic foot .....	cu ft
Candlepower .....	cp	Cubic feet per second.....cfs	
Center to center.....c to c		Cubic inch .....	cu in.
		Cubic meter.....cu in or m <sup>3</sup>	

† Abbreviation recommended by the A.S.M.E. Main Committee on Power Test Codes

$R = 1 \text{ } R_{10}$   
 kB = 1000 Btu  
 MB = 1,000,000 Btu

Cubic micron.cu $\mu$ or cu mu or $\mu^3$	Free aboard ship.....spell out
Cubic millimeter.cu mm or $\text{mm}^3$	Free alongside ship.....spell out
Cubic yard .....cu yd	Free on board.....f.o.b.
Current density .....spell out	Freezing point .....fp
Cylinder .....cyl	Frequency .....spell out
Day .....spell out	Furlong .....fur.
Decibel .....db	Fusion point .....fnp
Degree* .....deg or $^\circ$	Gallon .....gal
Degree Centigrade .....C	Gallons per minute.....gpm
Degree Fahrenheit .....F	Gallons per second.....gps
Degree Kelvin .....K	Grain .....spell out
Degree Réaumur .....R	Gram .....g
Diameter .....diam	Gram-calory .....g-cal
Direct-current (as adjective)..d-c	Greatest common divisor....gcd
Dollar .....\$	Hectare .....ha
Dozen .....doz	Henry .....h
Dram .....dr	High-pressure (adjective)....h-p
Efficiency .....eff	Hogshead .....hhd
Electric .....elec	Horsepower .....hp
Electromotive force .....emf	Horsepower-hour .....hp-hr
Elevation .....el	Hour .....hr
Engine .....eng	Hundred .....C
Engineer .....enr	Hundredweight (112 lb)....cwt
Engineering .....engg	Hyperbolic sine .....sinh
Equation .....eq	Hyperbolic cosine .....cosh
External .....ext	Hyperbolic tangent .....tanh
Farad .....spell out	Inch .....in.
Feet board measure (board	Inch-pound .....in-lb
feet) .....fbm	Inches per second.....ips
Feet per minute.....fpm	Indicated horsepower .....ihp
Feet per second.....fps	Indicated horsepower-hour.ihp-hr
Fluid .....fl	Intermediate-pressure (adject-
Foot .....ft	tive) .....i-p
Foot-candle .....ft-c	Internal .....int
Foot-Lambert .....ft-L	Joule .....j
Foot-pound .....ft-lb	Kilocycle .....kc
Foot-pound-second (system)..fps	Kilogram .....kg
Franc .....fr	Kilogram-meter .....kg-m

\* There are circumstances under which one or the other of these forms is preferred. In general the sign  $^\circ$  is used where space conditions make it necessary, as in tabular matter, and when abbreviations are cumbersome, as in some angular measurements; i.e.,  $59^\circ 23' 42''$ . In the interest of simplicity and clarity the Committee has recommended that the abbreviation for the temperature scale, F, C, K, etc., always be included in expressions for numerical temperatures but, wherever feasible, the abbreviation for "degree" be omitted; as  $69^\circ \text{F}$ .

Kilograms per cubic meter.....	Micromicron ..... $\mu\mu$ or $\mu\mu$
.....kg per cu m or $\text{kg/m}^3$	Micron ..... $\mu$ $\mu$
Kilograms per second.....kgps	Microwatt ..... $\mu\text{w}$ or $\mu\text{w}$
Kiloliter .....kl	Mile .....spell out
Kilometer .....km	Miles per hour.....mph
Kilometers per second.....km/s	Miles per hour per second.mph/s
Kilo- (reactive kilovolt-ampere) .....kvar	Milliampere .....ma
Kilo- (reactive kilovolt-ampere-hour) .....kvarh	Millifarad .....mf
Kilovolt .....kv	Milligram .....mg
Kilovolt-ampere .....kva	Millihenry .....mh
Kilowatt .....kw	Millilambert .....mL
Kilowatthour .....kwhr	Milliliter .....ml
Lambert .....L	Millimeter .....mm
Latitude .....lat	Millimicron..... $\text{m}\mu$ or $\text{m}\mu$
Least common multiple.....lcm	Million .....spell out
Linear foot .....lin ft	Million gallons per day.....mgd
Lira .....spell out	Millivolt .....mv
Liter .....l	Minimum .....min
Liquid .....liq	Minute .....min
Logarithm (common) .....log	Minute (angular measure).....'
Logarithm (natural).....log or ln	Molecular weight .....mol. wt
Longitude .....long.	Mol. ....spell out
Low-pressure (as adjective).....l-p	Month .....spell out
Lumen .....l	National Electric Code.....NEC
Lumen-hour .....l-hr	Ohm .....spell out
Lumens per watt.....lpw	Ohm-centimeter .....ohm-cm
Magnetomotive force .....mmf	Ounce .....oz
Mark (German coinage).....M.	Ounce-foot .....oz-ft
Mass .....spell out	Ounce-inch .....oz-in.
Mathematics (ical) .....math	Parts per million.....ppm
Maximum .....max	Peck .....pk
Mean effective pressure.....mep	Penny (Pence) .....d
Mean horizontal candlepower.....mhcp	Pennyweight .....dwt
Megohm .....spell out	Peso .....spell out
Melting point .....mp	Pint .....pt
Meter .....m	Potential .....spell out
Meter-kilogram .....m-kg	Potential difference.....spell out
Mho .....spell out	Pound .....lb
Microampere ..... $\mu\text{a}$ or $\mu\text{a}$	Pound-foot .....lb-ft
Microfarad ..... $\mu\text{f}$ or $\mu\text{f}$	Pound-inch .....lb-in.
	Pounds per brake horsepower-hour .....lb per bhp-hr

Pounds per sq ft....lb per sq ft	Square kilometer...sq km or km <sup>2</sup>
Pounds per sq in....lb per sq in	Square meter.....sq m or m <sup>2</sup>
Pound sterling .....£	Square micron.sq $\mu$ or sq mu or $\mu^2$
Power factor .....spell out	Square millimeter.sq. mm or mm <sup>2</sup>
Quart .....qt	Square root of mean square..rms
Radian .....spell out	Standard .....std
Reactive kilovolt-ampere....rkva	Stere .....s
Reactive volt-ampere .....rva	Tangent .....tan
Revolutions per minute.....rpm	Temperature .....temp
Revolutions per second.....rps	Tensile strength .....ts
Rod .....spell out	Thousand .....M
Root mean square.....rms	Ton .....spell out
Round .....rd	Ton-mile .....spell out
Secant .....sec	Twaddel .....Twad
Second .....sec	Var (reactive volt-ampere)...var
Second (angular measure)...."	Versed sine .....vers
Second-foot (see cu ft per sec)	Volt .....v
Shaft horsepower .....shp	Volt-ampere .....va
Shilling .....s	Volt-coulomb .....spell out
Sine .....sin	Watt .....w
Specific gravity .....sp gr	Watthour .....whr
Specific heat .....sp ht	Watts per candle.....wpc
Spherical candle power.....scp	Week .....spell out
Square .....sq	Weight .....wt
Square centimeter...sq cm or cm <sup>2</sup>	Yard .....yd
Square foot .....sq ft	Year .....yr
Square inch .....sq in	

## ADDENDA

Alternative abbreviations conforming to the practice of the International Electrotechnical Commission.

Ampere .....A	Microfarad ..... $\mu$ F
Ampere-hour .....Ah	Microwatt ..... $\mu$ W
Coulomb .....C	Milliampere .....mA
Farad .....F	Millifarad .....mF
Henry .....H	Millihenry .....mH
Joule .....J	Millivolt .....mV
Kilovolt .....kV	Ohm ..... $\Omega$
Kilovolt-ampere .....kVA	Volt .....V
Kilowatt .....kW	Volt-ampere .....VA
Kilowatthour .....kWh	Volt-coulomb .....VC
Megawatt .....MW	Watt .....W
Megohm .....M $\Omega$	Watthour .....Wh
Microampere ..... $\mu$ A	

## APPENDIX VII

### SYMBOLS FOR MECHANICS, STRUCTURAL ENGINEERING AND TESTING MATERIALS

Published by courtesy of the American Standards Association

Acceleration, angular .....	$\alpha$ (alpha)
Acceleration, due to gravity .....	$g$
Acceleration, linear .....	$a$
Angular distance .....	$\theta$ (theta)
Angular velocity .....	$\omega$ (omega)
Area .....	$A$
Axes, through any point.....	$X-X$ $Y-Y$ $Z-Z$
Breadth .....	$b$
Center of rotation.....	$O$
Coefficient of sliding friction.....	$f$
Concentrated load (same as force).....	$F$
Constants .....	$C$
Curvature, radius of .....	$\rho$ (rho)
Deflection .....	$y$
Deflection of a panel point of a truss.....	$\Delta$ (delta)
Density .....	$\rho$ (rho) or $d$
Depth .....	$d$
Diameter .....	$D$
Distance, linear .....	$s$
Eccentricity of application of load.....	$e$
Efficiency (hydraulic, mechanical, volumetric).....	$e_h, e_m, e_v$
Elasticity, modulus of.....	$E$
Elongation, unit .....	$\delta$ (delta)
Force .....	$F$
Force in any bar of a framed structure due to a load of unity applied at any point in any direction.....	$u$
Frequency (harmonic motion).....	$f$ or $n$
Gyration, radius of .....	$k$
Head .....	$H$ or $h$
Height .....	$h$
Inertia, rectangular moment of.....	$I$
Inertia, polar moment of.....	$J$
Length .....	$L$
Load per unit distance.....	$w$
Load, total .....	$W$
Mass .....	$m$

Modulus of rupture.....	<i>R</i>
Moment in inch-pounds at any section of a girder due to the moment of one inch-pound applied to the girder at any point.....	<i>m</i>
Moment of force, including bending moment.....	<i>M</i>
Neutral axis, distance to extreme fiber.....	<i>c</i>
Number of revolutions per unit of time.....	<i>n</i>
Period (harmonic motion) .....	<i>T</i>
Power, horsepower .....	<i>P</i>
Pressure per unit of area.....	<i>p</i>
Radius .....	<i>r</i>
Ratio between modulus of elasticity of steel and modulus of elasticity of concrete.....	<i>n</i>
Ratio of the distance from the neutral axis to the outer fiber of a reinforced concrete beam to the distance from the outer fiber to the point of application of the resultant tensile stress .....	<i>k</i>
Ratio of the lever arm of the resisting couple in a reinforced concrete beam to the distance between the outer compressive fiber and the point of application of the resultant tensile stress.....	<i>j</i>
Reactions .....	<i>R</i>
Section modulus .....	<i>Z</i> or <i>S</i>
Statical moment of any area about a given axis.....	<i>Q</i>
Steel ratio, in reinforced concrete beams.....	<i>p</i>
Stress, unit .....	<i>s</i>
Stress, unit compressive .....	<i>s<sub>c</sub></i>
Stress, unit tensile .....	<i>s<sub>t</sub></i>
Stress, unit shear .....	<i>s<sub>s</sub></i>
Stress, total tensile or total steel, in reinforced concrete .....	<i>T</i>
Stress, total compressive or total concrete, in reinforced concrete .....	<i>C</i>
Stress, total shear .....	<i>V</i>
Stress, unit concrete, in reinforced concrete.....	<i>f<sub>c</sub></i>
Stress, unit steel, in reinforced concrete.....	<i>f<sub>s</sub></i>
Stress, unit shear of concrete .....	<i>v</i>
Temperature, absolute .....	<i>T</i>
Temperature, ordinary .....	<i>t</i>
Thickness .....	<i>d</i> or <i>t</i>
Time .....	<i>t</i>
Torque .....	<i>T</i>
Velocity, linear .....	<i>V</i> or <i>v</i>
Volume .....	<i>V</i>
Work, or energy.....	<i>W</i>

# APPENDIX VIII

## MISCELLANEOUS USEFUL INFORMATION

### WEIGHTS AND MEASURES—ENGLISH AND METRIC EQUIVALENTS

1 pound (lb.)	=453.6 grammes.
100 lbs.	=45.36 kilos.
112 lbs.	=50.80 kilos.
1 net ton (2000 lbs.)	=907.2 kilos.
1 gross ton (2240 lbs.)	=1016 kilos.
1 kilo	=2.2046 lbs.
100 kilos	=220.46 lbs.
1 metric ton (1000 kilos)	=2204.6 lbs.=0.9842 gross ton=1.1023 net tons.
1 inch	=25.40 millimeters.
1 foot (12 inches)	=30.48 centimeters.
1 yard (3 feet)	=91.44 centimeters.
1 mile (1760 yards)	=1609.35 meters.
1 millimeter	=0.03937 inch.
1 centimeter	=0.3937 inch.
1 meter	=39.37 inches=3.2808 feet.
1 kilometer	=0.62137 mile=1093.6 yards.
1 square inch	{ =6.4516 square centimeters.
	{ =645.16 square millimeters.
1 square foot	=0.0929 square meter.
1 square yard	=0.8361 square meter.
1 square millimeter	=0.00155 square inch.
1 square centimeter	=0.155 square inch.
1 square meter	{ =10.7639 square feet.
	{ =1.196 square yards.
1 pound per foot	=1.4882 kilos per meter.
1 pound per yard	=0.4961 kilo per meter.
1 pound per square inch	=0.0703 kilo per square centimeter.
1 pound per square foot	=4.8825 kilos per square meter.
1 kilo per meter	=0.6720 pound per foot.
1 kilo per square millimeter	=1422.32 pounds per square inch.
1 kilo per square centimeter	=14.2232 pounds per square inch.
1 kilo per square meter	{ =0.2048 pound per square foot.
	{ =1.8433 pounds per square yard.

## CONVERSION FACTORS

Selections from a booklet of—"Conversion Factors for Engineers"—distributed by The Dorr Co., New York City.

The word gallon, used in any conversion factor, designates U. S. gallon. Likewise, the word ton designates a short ton, 2,000 pounds.

The figures  $10^{-1}$ ,  $10^{-2}$ ,  $10^{-3}$ , etc., denote 0.1, 0.01, 0.001, etc., respectively.

The figures  $10^1$ ,  $10^2$ ,  $10^3$ , etc., denote 10, 100, 1000, etc., respectively.

"Parts per Million" (designated as p.p.m.), is always by weight. As used in the sanitary field, p.p.m. represents the number of pounds of dry solids contained in one million pounds of water. In this field, one part per million may be expressed as 8.345 pounds of dry solids to one million U. S. gallons of water.

Multiply	By	To Obtain
Acres .....	43,560	Square feet
Acres .....	4047	Square meters
Acre-feet .....	43,560	Cubic feet
Acre-feet .....	325,851	Gallons
Acre-feet .....	1233.49	Cubic meters
Atmospheres .....	29.92	Inches of mercury
Atmospheres .....	33.90	Feet of water
Atmospheres .....	76.0	Cms. of mercury
Atmospheres .....	14.70	Lb./sq. inch
Barrels cement .....	376	Pounds—cement
Bags or sacks-cement .....	94	Pounds—cement
British Thermal Units .....	777.5	Foot-lb.
British Thermal Units .....	$3.927 \times 10^{-4}$	Horse-power-hrs.
British Thermal Units .....	$2.928 \times 10^{-4}$	Kilowatt-hrs.
British Thermal Units .....	0.2520	Kilogram-calories
British Thermal Units .....	107.5	Kilogram-meters
B.T.U./min. ....	12.96	Foot-lb./sec.
B.T.U./min. ....	0.02356	Horse-power
B.T.U./min. ....	0.01757	Kilowatts
Centimeters .....	0.3937	Inches
Centimeters of mercury .....	0.01316	Atmospheres
Centimeters of Mercury .....	0.4461	Feet of water
Centimeters of Mercury .....	27.85	Lb./sq. ft.
Centimeters of Mercury .....	0.1934	Lb./sq. inch
Centimeters/second .....	1.969	Feet/min.
Centimeters/second .....	0.03281	Feet/sec.
Centimeters/second .....	0.6	Meters/min.
Cubic Centimeters .....	$3.531 \times 10^{-5}$	Cubic feet
Cubic Centimeters .....	$6.102 \times 10^{-2}$	Cubic inches
Cubic Centimeters .....	$2.642 \times 10^{-4}$	Gallons
Cubic Centimeters .....	$10^{-6}$	Cubic meters
Cubic Centimeters .....	$10^{-3}$	Liters
Cubic feet .....	7.48052	Gallons
Cubic feet .....	1728	Cubic inches
Cubic feet .....	0.03704	Cubic yards
Cubic feet .....	28.32	Liters
Cubic feet .....	$2.832 \times 10^4$	Cubic cms.
Cubic feet .....	0.02832	Cubic meters

Multiply	By	To Obtain
Cubic feet/second .....	0.646317 .....	Million gals./day
Cubic feet/second .....	448.831 .....	Gallons/min.
Cubic inches .....	16.39 .....	Cubic centimeters
Cubic inches .....	$5.787 \times 10^{-4}$ .....	Cubic feet
Cubic inches .....	$1.639 \times 10^{-5}$ .....	Cubic meters
Cubic inches .....	$4.329 \times 10^{-3}$ .....	Gallons
Cubic inches .....	$1.639 \times 10^{-2}$ .....	Liters
Cubic meters .....	35.31 .....	Cubic feet
Cubic meters .....	1.308 .....	Cubic yards
Cubic meters .....	264.2 .....	Gallons
Cubic meters .....	$10^3$ .....	Liters
Cubic yards .....	27 .....	Cubic feet
Cubic yards .....	46.656 .....	Cubic inches
Cubic yards .....	0.7646 .....	Cubic meters
Cubic yards .....	202.0 .....	Gallons
Cubic yards .....	764.6 .....	Liters
Drams .....	27.34375 .....	Grains
Drams .....	0.0625 .....	Ounces
Drams .....	1.771845 .....	Grams
Fathoms .....	6 .....	Feet
Feet .....	30.48 .....	Centimeters
Feet .....	0.3048 .....	Meters
Feet of water .....	0.8826 .....	Inches of mercury
Feet of water .....	0.4335 .....	Lb./sq. inch
Feet of water .....	62.43 .....	Lb./sq. ft.
Feet of water .....	0.02950 .....	Atmospheres
Feet of water .....	304.8 .....	Kgs./sq. meter
Feet/sec. ....	30.48 .....	Centimeters/sec.
Feet/sec. ....	18.29 .....	Meters/min.
Foot-pounds .....	$1.286 \times 10^{-8}$ .....	British thermal units
Foot-pounds .....	$5.050 \times 10^{-7}$ .....	Horse-power-hrs.
Foot-pounds .....	0.1383 .....	Kilograms-meters
Foot-pounds .....	$3.766 \times 10^{-7}$ .....	Kilowatt-hrs.
Foot-pounds/min. ....	$3.030 \times 10^{-5}$ .....	Horse-power
Foot-pounds/min. ....	$2.260 \times 10^{-5}$ .....	Kilowatts
Gallons .....	0.1337 .....	Cubic feet
Gallons .....	231 .....	Cubic inches
Gallons .....	3785 .....	Cubic centimeters
Gallons .....	$3.785 \times 10^{-3}$ .....	Cubic meters
Gallons .....	3.785 .....	Liters
Gallons, Imperial .....	1.200095 .....	U.S. gallons
Gallons, U. S. ....	0.83267 .....	Imperial gallons
Gallons water .....	8.3453 .....	Pounds of water
Gallons/min. ....	$2.228 \times 10^{-8}$ .....	Cubic feet/sec.
Gallons/min. ....	0.06308 .....	Liters/sec.
Gallons/min. ....	8.0208 .....	Cu. ft./hr.
Grains (troy) .....	1 .....	Grains (avoir.)
Grains .....	0.06480 .....	Grams
Grains/U.S. gal. ....	17.118 .....	Parts/million
Grains/U.S. gal. ....	142.86 .....	Lb./million gal.
Grains/Imp. gal. ....	14.254 .....	Parts/million
Grams .....	15.43 .....	Grains

<b>Multiply</b>	<b>By</b>	<b>To Obtain</b>
Grams .....	0.03527	Ounces
Grams .....	980.7	Dynes
Grams/liter .....	58.417	Grains/gal.
Grams/liter .....	8.345	Pounds/1000 gals.
Grams/liter .....	1000	Parts/million
Hectares .....	2.471	Acres
Horse-power .....	42.44	B.T.Units/min.
Horse-power .....	550	Foot-lb./sec.
Horse-power .....	0.7457	Kilowatts
Horse-power (boiler) .....	33.479	B.T.U./hr.
Horse-power (boiler) .....	9.803	Kilowatts
Inches .....	2.540	Centimeters
Inches of mercury .....	1.133	Feet of water
Inches of mercury .....	0.4912	Lb./sq. inch
Inches of mercury .....	0.03342	Atmospheres
Inches of mercury .....	345.3	Kgs./sq. meter
Inches of water .....	0.07355	Inches of mercury
Inches of water .....	0.03613	Lb./sq. inch
Kilograms .....	2.205	Lb.
Kilograms-calories/min. ....	51.43	Foot-pounds/sec.
Kilograms-calories/min. ....	0.09351	Horse-power
Kilograms-calories/min. ....	0.06972	Kilowatts
Kgs./sq. meter .....	$3.281 \times 10^{-8}$	Feet of water
Kgs./sq. meter .....	$1.422 \times 10^{-8}$	Lb./sq. inch
Kilometers .....	3281	Feet
Kilometers .....	0.6214	Miles
Kilometers/hr. ....	0.9113	Feet/sec.
Kilometers/hr. ....	27.78	Centimeters/sec.
Kilowatts .....	56.92	B.T.Units/min.
Kilowatts .....	737.6	Foot-lb./sec.
Kilowatts .....	1.341	Horse-power
Kilowatts .....	14.34	Kg.-calories/min.
Liters .....	0.2642	Gallons
Liters .....	61.02	Cubic inches
Liters .....	0.03531	Cubic feet
Meters .....	3.281	Feet
Meters .....	39.37	Inches
Meters .....	1.094	Yards
Miles .....	5280	Feet
Miles .....	1.609	Kilometers
Miles/min. ....	88	Feet/sec.
Miles/min. ....	1.609	Kilometers/min.
Milligrams/liter .....	1	Parts/million
Million gals./day .....	1.54723	Cubic ft./sec.
Miner's inches .....	1.5	Cubic ft./min.
Ounces .....	28.349527	Grams
Ounces .....	437.5	Grains
Ounces .....	0.9115	Ounces (troy)
Ounces (fluid) .....	1.805	Cubic inches
Ounces (fluid) .....	29.57	Cubic cm.

<b>Multiply</b>	<b>By</b>	<b>To Obtain</b>
Parts/million .....	8.345 .....	Lb./million gal.
Parts/million .....	0.0584 .....	Grains/U. S. gal.
Parts/million .....	0.07016 .....	Grains/Imp. gal.
Pounds .....	16 .....	Ounces
Pounds .....	7000 .....	Grains
Pounds .....	453.5924 .....	Grams
Pounds .....	1.21528 .....	Pounds (troy)
Pounds of water.....	0.01602 .....	Cubic feet
Pounds of water.....	27.68 .....	Cubic inches
Pounds of water.....	0.1198 .....	Gallons
Pounds/cubic foot .....	0.01602 .....	Grams/cubic cm.
Pounds/cubic foot .....	16.02 .....	Kgs./cubic meter
Pounds/cubic foot .....	$5.787 \times 10^{-4}$ .....	Lb./cubic inch
Pounds/foot .....	1.488 .....	Kgs./meter
Pounds/inch .....	178.6 .....	Grams/cm.
Pounds/sq. foot .....	0.01602 .....	Feet of water
Pounds/sq. foot .....	4.883 .....	Kgs./sq. meter
Pounds/sq. inch .....	2.307 .....	Feet of water
Pounds/sq. inch .....	2.036 .....	Inches of mercury
Pounds/sq. inch .....	0.06804 .....	Atmospheres
Pounds/sq. inch .....	703.1 .....	Kgs./sq. meter
Quires .....	25 .....	Sheets
Reams .....	500 .....	Sheets
Square centimeters .....	0.1550 .....	Square inches
Square centimeters .....	$1.076 \times 10^{-8}$ .....	Square feet
Square feet .....	144 .....	Square inches
Square feet .....	0.09290 .....	Square meters
Square feet .....	$2.296 \times 10^{-5}$ .....	Acres
Square inches .....	6.452 .....	Square centimeters
Square kilometers .....	247.1 .....	Acres
Square kilometers .....	$10.76 \times 10^8$ .....	Square feet
Square kilometers .....	$1.196 \times 10^8$ .....	Square yards
Square meters .....	10.76 .....	Square feet
Square meters .....	1.196 .....	Square yards
Square miles .....	640 .....	Acres
Square miles .....	$27.88 \times 10^8$ .....	Square feet
Square miles .....	2.590 .....	Square kilometers
Square yards .....	9 .....	Square feet
Square yards .....	0.8361 .....	Square meters
Square yards .....	$2.066 \times 10^{-4}$ .....	Acres
Tons (long) .....	1016 .....	Kilograms
Tons (long) .....	2240 .....	Pounds
Tons (long) .....	1.12000 .....	Tons (short)
Tons (metric) .....	$10^8$ .....	Kilograms
Tons (metric) .....	2205 .....	Pounds
Tons (short) .....	2000 .....	Pounds
Tons (short) .....	907.18486 .....	Kilograms
Tons of water/24 hrs. ....	0.16643 .....	Gallons/min.
Watts .....	0.05692 .....	B.T.Units/min.
Watts .....	0.7376 .....	Foot-pounds/sec.
Watts .....	$1.341 \times 10^{-8}$ .....	Horse-power
Watts .....	0.01434 .....	Kg.-calories/min.
Yards .....	0.9144 .....	Meters

## TEMPERATURE INTERCONVERSION TABLES (°C → °F)

## CONVERSION TABLE: DEGREES CENTIGRADE TO DEGREES FAHRENHEIT

From Miscellaneous Publication M-126, National Bureau of Standards

°C	0	10	20	30	40	50	60	70	80	90		
	F	F	F	F	F	F	F	F	F	F	°C	°F
-200	-328	-346	-364	-382	-400	-418	-436	-454	-472	-490		
-100	-148	-166	-184	-202	-220	-238	-256	-274	-292	-310		
0	+32	+14	-4	-22	-40	-58	-76	-94	-112	-130		
0	32	50	68	86	104	122	140	158	176	194		
100	212	230	248	266	284	302	320	338	356	374	1	1.8
200	392	410	428	446	464	482	500	518	536	554	2	3.6
300	572	590	608	626	644	662	680	698	716	734	3	5.4
400	752	770	788	806	824	842	860	878	896	914	4	7.2
500	932	950	968	986	1004	1022	1040	1058	1076	1094	5	9.0
600	1112	1130	1148	1166	1184	1202	1220	1238	1256	1274	6	10.8
700	1292	1310	1328	1346	1364	1382	1400	1418	1436	1454	7	12.6
800	1472	1490	1508	1526	1544	1562	1580	1598	1616	1634	8	14.4
900	1652	1670	1688	1706	1724	1742	1760	1778	1796	1814	9	16.2
1000	1832	1850	1868	1886	1904	1922	1940	1958	1976	1994	10	18.0
1100	2012	2030	2048	2066	2084	2102	2120	2138	2156	2174	°F	°C
1200	2192	2210	2228	2246	2264	2282	2300	2318	2336	2354		
1300	2372	2390	2408	2426	2444	2462	2480	2498	2516	2534		
1400	2552	2570	2588	2606	2624	2642	2660	2678	2696	2714		
1500	2732	2750	2768	2786	2804	2822	2840	2858	2876	2894	1	0.56
1600	2912	2930	2948	2966	2984	3002	3020	3038	3056	3074	2	1.11
1700	3092	3110	3128	3146	3164	3182	3200	3218	3236	3254	3	1.67
1800	3272	3290	3308	3326	3344	3362	3380	3398	3416	3434	4	2.22
1900	3452	3470	3488	3506	3524	3542	3560	3578	3596	3614	5	2.78
2000	3632	3650	3668	3686	3704	3722	3740	3758	3776	3794	6	3.33
2100	3812	3830	3848	3866	3884	3902	3920	3938	3956	3974	7	3.89
2200	3992	4010	4028	4046	4064	4082	4100	4118	4136	4154	8	4.44
2300	4172	4190	4208	4226	4244	4262	4280	4298	4316	4334	9	5.00
2400	4352	4370	4388	4406	4424	4442	4460	4478	4496	4514	10	5.56
2500	4532	4550	4568	4586	4604	4622	4640	4658	4676	4694	11	6.11
2600	4712	4730	4748	4766	4784	4802	4820	4838	4856	4874	12	6.67
2700	4892	4910	4928	4946	4964	4982	5000	5018	5036	5054	13	7.22
2800	5072	5090	5108	5126	5144	5162	5180	5198	5216	5234	14	7.78
2900	5252	5270	5288	5306	5324	5342	5360	5378	5396	5414	15	8.33
3000	5432	5450	5468	5486	5504	5522	5540	5558	5576	5594	16	8.89
3100	5612	5630	5648	5666	5684	5702	5720	5738	5756	5774	17	9.44
3200	5792	5810	5828	5846	5864	5882	5900	5918	5936	5954	18	10.00
3300	5972	5990	6008	6026	6044	6062	6080	6098	6116	6134		
3400	6152	6170	6188	6206	6224	6242	6260	6278	6296	6314		
3500	6332	6350	6368	6386	6404	6422	6440	6458	6476	6494		
3600	6512	6530	6548	6566	6584	6602	6620	6638	6656	6674		
3700	6692	6710	6728	6746	6764	6782	6800	6818	6836	6854		
3800	6872	6890	6908	6926	6944	6962	6980	6998	7016	7034		
3900	7052	7070	7088	7106	7124	7142	7160	7178	7196	7214		
°C	0	10	20	30	40	50	60	70	80	90		

EXAMPLES: 1547° C = 2814° F + 12.6° F = 2826.6° F, 3367° F = 1853° C + 2.78° C = 1855.78° C.

## TEMPERATURE INTERCONVERSION TABLES (°F → °C)

## CONVERSION TABLE: DEGREES FAHRENHEIT TO DEGREES CENTIGRADE

(Single boldface figures indicate recurring decimals)

°F	0	10	20	30	40	50	60	70	80	90		
	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C		
-400	-240.0	-245.5	-251.1	-256.6	-262.2	-267.7	-273.3	-278.8	-284.4	-289.9		
-300	-184.4	-190.0	-195.5	-201.1	-206.6	-212.2	-217.7	-223.3	-228.8	-234.4		
-200	-128.8	-134.4	-140.0	-145.5	-151.1	-156.6	-162.2	-167.7	-173.3	-178.8		
-100	-73.3	-78.8	-84.4	-90.0	-95.5	-101.1	-106.6	-112.2	-117.7	-123.3		
0	-17.7	-23.3	-28.8	-34.4	-40.0	-45.5	-51.1	-56.6	-62.2	-67.7		
0	-17.7	-12.2	-6.6	-1.1	+4.4	+10.0	+15.5	+21.1	+26.6	+32.2		
100	37.7	43.3	48.8	54.4	60.0	65.5	71.1	76.6	82.2	87.7		
200	93.3	98.8	104.4	110.0	115.5	121.1	126.6	132.2	137.7	143.3		
300	148.8	154.4	160.0	165.5	171.1	176.6	182.2	187.7	193.3	198.8		
400	204.4	210.0	215.5	221.1	226.6	232.2	237.7	243.3	248.8	254.4		
500	260.0	265.5	271.1	276.6	282.2	287.7	293.3	298.8	304.4	310.0		
600	315.5	321.1	326.6	332.2	337.7	343.3	348.8	354.4	360.0	365.5		
700	371.1	376.6	382.2	387.7	393.3	398.8	404.4	410.0	415.5	421.1		
800	426.6	432.2	437.7	443.3	448.8	454.4	460.0	465.5	471.1	476.6		
900	482.2	487.7	493.3	498.8	504.4	510.0	515.5	521.1	526.6	532.2		
1000	537.7	543.3	548.8	554.4	560.0	565.5	571.1	576.6	582.2	587.7	°F	°C
1100	593.3	598.8	604.4	610.0	615.5	621.1	626.6	632.2	637.7	643.3	1	0.5
1200	648.8	654.4	660.0	665.5	671.1	676.6	682.2	687.7	693.3	698.8	2	1.1
1300	704.4	710.0	715.5	721.1	726.6	732.2	737.7	743.3	748.8	754.4	3	1.6
1400	760.0	765.5	771.1	776.6	782.2	787.7	793.3	798.8	804.4	810.0		
1500	815.5	821.1	826.6	832.2	837.7	843.3	848.8	854.4	860.0	865.5		
1600	871.1	876.6	882.2	887.7	893.3	898.8	904.4	910.0	915.5	921.1	4	2.2
1700	926.6	932.2	937.7	943.3	948.8	954.4	960.0	965.5	971.1	976.6	5	2.7
1800	982.2	987.7	993.3	998.8	1004.4	1010.0	1015.5	1021.1	1026.6	1032.2	6	3.3
1900	1037.7	1043.3	1048.8	1054.4	1060.0	1065.5	1071.1	1076.6	1082.2	1087.7	7	3.8
2000	1093.3	1098.8	1104.4	1110.0	1115.5	1121.1	1126.6	1132.2	1137.7	1143.3	8	4.4
											9	5.0
2100	1148.8	1154.4	1160.0	1165.5	1171.1	1176.6	1182.2	1187.7	1193.3	1198.8		
2200	1204.4	1210.0	1215.5	1221.1	1226.6	1232.2	1237.7	1243.3	1248.8	1254.4		
2300	1260.0	1265.5	1271.1	1276.6	1282.2	1287.7	1293.3	1298.8	1304.4	1310.0		
2400	1315.5	1321.1	1326.6	1332.2	1337.7	1343.3	1348.8	1354.4	1360.0	1365.5		
2500	1371.1	1376.6	1382.2	1387.7	1393.3	1398.8	1404.4	1410.0	1415.5	1421.1		
2600	1426.6	1432.2	1437.7	1443.3	1448.8	1454.4	1460.0	1465.5	1471.1	1476.6		
2700	1482.2	1487.7	1493.3	1498.8	1504.4	1510.0	1515.5	1521.1	1526.6	1532.2		
2800	1537.7	1543.3	1548.8	1554.4	1560.0	1565.5	1571.1	1576.6	1582.2	1587.7		
2900	1593.3	1598.8	1604.4	1610.0	1615.5	1621.1	1626.6	1632.2	1637.7	1643.3		
3000	1648.8	1654.4	1660.0	1665.5	1671.1	1676.6	1682.2	1687.7	1693.3	1698.8		
3100	1704.4	1710.0	1715.5	1721.1	1726.6	1732.2	1737.7	1743.3	1748.8	1754.4		
3200	1760.0	1765.5	1771.1	1776.6	1782.2	1787.7	1793.3	1798.8	1804.4	1810.0		
3300	1815.5	1821.1	1826.6	1832.2	1837.7	1843.3	1848.8	1854.4	1860.0	1865.5		
3400	1871.1	1876.6	1882.2	1887.7	1893.3	1898.8	1904.4	1910.0	1915.5	1921.1		
3500	1926.6	1932.2	1937.7	1943.3	1948.8	1954.4	1960.0	1965.5	1971.1	1976.6		
3600	1982.2	1987.7	1993.3	1998.8	2004.4	2010.0	2015.5	2021.1	2026.6	2032.2		
°F	0	10	20	30	40	50	60	70	80	90		

EXAMPLE:  $-240.0^{\circ}\text{F} = -151.11^{\circ}\text{C}$ ;  $233^{\circ}\text{F} = 117.78^{\circ}\text{C}$ ;  $154.40^{\circ}\text{C} = 309.92^{\circ}\text{F}$ ;  $373.15^{\circ}\text{F} = 201.19^{\circ}\text{C}$ ;  $1^{\circ}\text{C} = 33.8^{\circ}\text{F}$ ;  $273.15^{\circ}\text{C} = 501.67^{\circ}\text{F}$ ;  $273.15^{\circ}\text{F} = 134.53^{\circ}\text{C}$ ;  $1.00^{\circ}\text{C} = 1.80^{\circ}\text{F}$ ;  $1.00^{\circ}\text{F} = 0.56^{\circ}\text{C}$ .

## THE CHEMICAL ELEMENTS

## THEIR ATOMIC NUMBERS, SYMBOLS, AND WEIGHTS, AND THEIR MELTING POINTS ON THE INTERNATIONAL TEMPERATURE SCALE

[For International Temperature Scale see BS J. Research 1, 635 (1928) RP22]

From Miscellaneous Publication M-126, National Bureau of Standards

Temperatures below  $-190^{\circ}\text{C}$ . are on the Centigrade Thermodynamic Scale.

The atomic weights given constitute the complete list of the International Weights of 1936, as approved and reported by the Committee on Atomic Weights of the International Union of Chemistry. There is reason to believe that the following (unofficial) values may prove more nearly correct: Aluminium, 26,974; carbon, 12,009; gallium, 69.74.

Atomic number	Atomic symbol	Name of element	Melting point	Atomic weight	Atomic number	Atomic symbol	Name of element	Melting point	Atomic weight
			$^{\circ}\text{C}$ .					$^{\circ}\text{C}$ .	
89	Ac	Actinium.....	* 1600	.....	60	Nd	Neodymium.....	840 $\pm 40$	144.27
13	Al	Aluminum.....	660.0 $\pm 0.1$	26.97	10	Ne	Neon.....	-248.6 $\pm 0.3$	20.183
51	Sb	Antimony.....	630.5 $\pm 0.1$	121.76	28	Ni	Nickel.....	1455 $\pm 1$	58.69
18	Ar	Argon.....	-189.3 $\pm 0.5$	39.944	7	N	Nitrogen.....	-210.0 $\pm 0.3$	14.008
33	As	Arsenic.....	* 814	74.91	76	Os	Osmium.....	2700 $\pm 200$	191.5
56	Ba	Barium.....	704 $\pm 20$	137.36	8	O	Oxygen.....	-218.8 $\pm 0.3$	16.0000
4	Be	Beryllium.....	1280 $\pm 40$	9.02	46	Pd	Palladium.....	1554 $\pm 1$	106.7
83	Bi	Bismuth.....	271.3 $\pm 0.1$	208.00	15	P	Phosphorus, Y.....	44.1 $\pm 0.1$	31.02
5	B	Boron.....	2300 $\pm 300$	10.82			Phosphorus, R.....	* 590	
35	Br	Bromine.....	-7.2 $\pm 0.2$	79.916	78	Pt	Platinum.....	1773.5 $\pm 1$	195.23
48	Cd	Cadmium.....	320.9 $\pm 0.1$	112.41	84	Po	Polonium.....	* 600	
20	Ca	Calcium.....	850 $\pm 20$	40.08	19	K	Potassium.....	63 $\pm 1$	39.096
6	C	Carbon.....	3700 $\pm 50$	12.00	59	Pr	Praseodymium.....	940 $\pm 50$	140.92
58	Ce	Cerium.....	600 $\pm 50$	140.13	91	Pa	Protactinium.....	* 3000	231
55	Ce	Cesium.....	28 $\pm 2$	132.91	88	Ra	Radium.....	700	226.05
17	Cl	Chlorine.....	-101 $\pm 2$	35.457	86	Rn	Radon.....	-71	222
24	Cr	Chromium.....	1800 $\pm 50$	52.01	75	Re	Rhenium.....	* 3600	186.31
27	Co	Cobalt.....	1490 $\pm 20$	58.94	45	Rh	Rhodium.....	1966 $\pm 3$	102.91
41	Co	Columbium.....	2000 $\pm 50$	92.91	37	Rb	Rubidium.....	39 $\pm 1$	85.44
29	Cu	Copper.....	1083.0 $\pm 0.1$	63.57	44	Ru	Ruthenium.....	2500 $\pm 100$	101.7
66	Dy	Dysprosium.....	.....	162.46	62	Sm	Samarium.....	> 1300	150.43
68	Er	Erbium.....	.....	167.64	21	Se	Scandium.....	1200	45.10
63	Eu	Europium.....	.....	152.0	34	Se	Selenium.....	220 $\pm 5$	78.96
9	F	Fluorine.....	-223 $\pm 10$	19.00	14	Si	Silicon.....	1430 $\pm 20$	28.06
64	Gd	Gadolinium.....	.....	157.3	47	Ag	Silver.....	960.5 $\pm 0.0$	107.880
31	Ga	Gallium.....	29.78 $\pm 0.02$	69.72	11	Na	Sodium.....	97.7 $\pm 0.2$	22.997
32	Ge	Germanium.....	958 $\pm 10$	72.60	38	Sr	Strontium.....	770 $\pm 10$	87.63
79	Au	Gold.....	1063.0 $\pm 0.0$	197.2	16	S	Sulfur.....	119.2 $\pm 0.2$	32.06
72	Hf	Hafnium.....	* 1700	178.6			Monoclinic.....	112.8 $\pm 0.2$	
2	He	Helium.....	* -271.4 $\pm 0.2$	4.002			Rhombic.....		
67	Ho	Holmium.....	.....	163.5	73	Ta	Tantalum.....	3000 $\pm 100$	180.88
1	H	Hydrogen.....	-252.2 $\pm 0.1$	1.0078	52	Te	Tellurium.....	450 $\pm 10$	127.61
		H <sub>2</sub> (normal).....	-252.2 $\pm 0.1$	.....	65	Tb	Terbium.....	327 $\pm 5$	158.9
		HD.....	-256.5 $\pm 0.2$	.....	81	Tl	Thallium.....	300 $\pm 3$	204.39
		D <sub>2</sub> (normal).....	-254.5 $\pm 0.2$	.....	90	Th	Thorium.....	1800 $\pm 150$	232.12
61	Bi	Indium.....	.....	114.76	69	Tm	Thulium.....	.....	168.4
49	In	Iodine.....	156.4 $\pm 0.1$	126.92	50	Sn	Tin.....	231.9 $\pm 0.1$	118.70
53	I	Iodine.....	114 $\pm 1$	126.92	22	Ti	Titanium.....	1520 $\pm 100$	47.90
77	Ir	Iridium.....	2454 $\pm 3$	193.1	74	W	Tungsten.....	3410 $\pm 20$	184.0
26	Fe	Iron.....	1535 $\pm 3$	55.84	92	U	Uranium.....	* 3600	238.14
36	Kr	Krypton.....	-157 $\pm 0.5$	83.7	23	V	Vanadium.....	1735 $\pm 50$	50.95
57	La	Lanthanum.....	826 $\pm 5$	138.92	54	Xe	Xenon.....	-112 $\pm 1$	131.3
82	Pb	Lead.....	327.4 $\pm 0.1$	207.2	70	Yb	Ytterbium.....	.....	173.04
3	Li	Lithium.....	186 $\pm 5$	6.940	39	Y	Yttrium.....	1490 $\pm 300$	88.92
71	Lu	Lutetium.....	.....	175.0	30	Zn	Zinc.....	419.5 $\pm 0.1$	65.38
12	Mg	Magnesium.....	650 $\pm 2$	24.32	40	Zr	Zirconium.....	1750 $\pm 700$	91.22
25	Mn	Manganese.....	1200 $\pm 20$	54.93			Element 85.....	* 250	
43	Ma	Masurium.....	* 2700	.....			Element 87.....	* 23	
80	Hg	Mercury.....	-38.87 $\pm 0.02$	200.61					
42	Mo	Molybdenum.....	2625 $\pm 50$	96.0					







































































\* Computed.

\* At 36 atmospheres.

\* At 30 atmospheres.

\* At 43 atmospheres.

# SUGGESTED SYMBOLS FOR PLANS, MAPS, AND CHARTS WORKS AND STRUCTURES

	IN USE	NOT IN USE
RESIDENCES AND COMMERCIAL _____		
CONDITION OF BUILDINGS (OPTIONAL)		
GOOD _____	G 	G 
FAIR _____	F 	F 
POOR _____	P 	P 
SCHOOLHOUSE _____		
CHURCH _____		
OTHER EDUCATIONAL INSTITUTIONS _____		
OTHER RELIGIOUS INSTITUTIONS _____		
CORRECTIONAL INSTITUTIONS _____		
HOSPITAL _____		
FACTORY _____		
RAILROAD STATION _____		
CAMP _____		
SAWMILL (STATIONARY) _____		
SAWMILL (PORTABLE) _____		
CEMETERY _____		
RUINS _____		
FORT _____		
BATTERY _____		
AIRPORT (GENERAL) _____		
FENCE (ANY KIND) _____		
MINE OR QUARRY OF ANY KIND OR OPEN CUT _____		
PROSPECT _____		
SHAFT _____		
MINE TUNNEL { OPENING _____		
SHOWING DIRECTION _____		
OIL OR GAS WELLS _____		
WINDMILL _____		
TANKS _____		
COKE OVENS _____		
CANAL OR DITCH _____		
ABANDONED CANAL OR DITCH _____		
FLUME _____		
RADIO STATION _____	EXISTING 	PROPOSED 
TELEGRAPH STATION _____	EXISTING 	PROPOSED 

From: "Suggested Symbols for Plans, Maps, and Charts," by the National Resources Committee.

## SUGGESTED SYMBOLS FOR PLANS, MAPS, AND CHARTS

### POWER AND COMMUNICATION

	EXISTING	PROPOSED
TELEGRAPH AND TELEPHONE LINES _____		
POWER TRANSMISSION LINES _____		
POWER DISTRIBUTION LINES _____		
POWER DISTRIBUTION AND TELEPHONE LINES _____		

## (a) TRANSMISSION LINES

	EXISTING	PROPOSED
SINGLE CIRCUIT _____		
SINGLE CIRCUIT ALTERNATE _____		
TWO CIRCUITS _____		
CROSS OVER _____		
INTER-CONNECTION _____		
DOUBLE CIRCUIT CONSTRUCTION, ONLY ONE LINE AT PRESENT INSTALLED _____		
PROJECTED TRANSMISSION LINE CONSTRUCTION WITH PROVISION FOR FUTURE 2ND CIRCUIT _____		
INDICATES CYCLE _____		

## (b) GENERATING STATIONS

FUEL PLANTS _____		
HYDRO PLANTS _____		
FUEL AND HYDRO PLANTS _____		
L - REFERS TO LICENSE GRANTED BY F. P. C. _____		
SEPARATE DETAIL FOR LARGE CITIES _____		

## PUBLICLY OWNED

FUEL PLANT _____		
HYDRO PLANT _____		
FUEL AND HYDRO _____		
MUNICIPALITIES BUYING POWER WHOLESALE AND DISTRIBUTING DETAIL _____		
SUBSTATION _____		

## NOTES AND ADDITIONAL SYMBOLS

- (a) - NUMBERS AT LINES INDICATE THOUSANDS OF VOLTS; THUS  $\frac{112}{-}$  -  
WEIGHT OF LINES CORRESPONDS TO SCALE OF MAP AND NUMBER OF KV.
- (b) - CAPACITY IN THOUSANDS OF KW. SHOWN THUS  $\frac{3}{1}$  -  
SIZE OF SYMBOL CORRESPONDS TO SCALE OF MAP AND NUMBER OF KW.

*From: "Suggested Symbols for Plans, Maps, and Charts," by the National Resources Committee.*

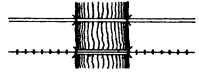
## SUGGESTED SYMBOLS FOR PLANS, MAPS, AND CHARTS

## TRANSPORTATION

## BRIDGES, FERRIES, WATERWAYS, AIRWAYS, ETC.

## BRIDGES

GENERAL (a) { \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

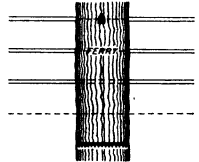


## FERRIES

{ \_\_\_\_\_  
 \_\_\_\_\_

## FORDS

{ ROAD \_\_\_\_\_  
 TRAIL \_\_\_\_\_



## DAM

\_\_\_\_\_

## WATERWAYS

CHANNELS OVER 12' DEEP \_\_\_\_\_

CHANNELS BETWEEN 9' AND 12' \_\_\_\_\_

CHANNELS BETWEEN 6' AND 9' \_\_\_\_\_

CHANNELS LESS THAN 6' \_\_\_\_\_

EXISTING PROPOSED



## AIRPORTS AND FACILITIES

GENERAL SYMBOL \_\_\_\_\_

ARMY - NAVY CORPS \_\_\_\_\_

COMMERCIAL OR MUNICIPAL \_\_\_\_\_

DEPARTMENT OF COMMERCE - INTERMEDIATE \_\_\_\_\_

MARKED AUXILIARY \_\_\_\_\_

EMERGENCY - PRIVATE \_\_\_\_\_

(a) STATE FIELD \_\_\_\_\_

SEA PLANE - FULL FACILITIES \_\_\_\_\_

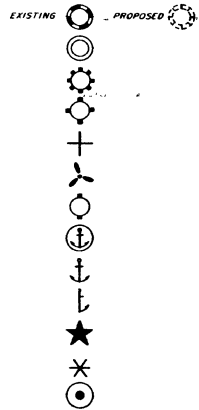
SEA PLANE - USUAL FACILITIES \_\_\_\_\_

SEA PLANE - LIMITED FACILITIES \_\_\_\_\_

AIR WAY LIGHT BEACON \_\_\_\_\_

LAND MARK BEACON \_\_\_\_\_

RADIO BEACON STATION \_\_\_\_\_



## AIRWAYS

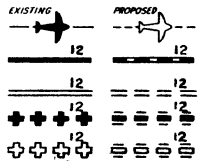
GENERAL SYMBOL \_\_\_\_\_

AIR-PLANE LINES - ALL YEAR \_\_\_\_\_

AIR-PLANE LINES - SEASONAL \_\_\_\_\_

SEA-PLANE LINES - ALL YEAR \_\_\_\_\_

SEA-PLANE LINES - SEASONAL \_\_\_\_\_



*From: "Suggested Symbols for Plans, Maps, and Charts," by the National Resources Committee.*

## SUGGESTED SYMBOLS FOR PLANS, MAPS, AND CHARTS

## TRANSPORTATION

## RAILROAD, BUS LINES, SUBWAYS, PIPE LINES, ETC.

## RAILROADS

SINGLE TRACK	_____	+++++
DOUBLE TRACK	_____	+++++
JUXTAPOSITION OF	_____	+++++
NARROW GAGE	_____	+++++
ELECTRIC (PASSENGER ONLY)	_____	{+++++ +++++}
IN ROAD OR STREET	_____	<u>ELECTRIC</u> <u>STEAM</u>
ABANDONED RAILROAD	_____	+++++
ABANDONED ELECTRIC LINE	_____	+++++

## RAILROADS-STEAM

## EXISTING PROPOSED

SINGLE TRACK	_____	+++++ + + + +
DOUBLE TRACK	_____	+++++ ++ ++ ++

## RAILROADS-ELECTRIC

SINGLE TRACK	_____	+++++ + + + +
DOUBLE TRACK	_____	+++++ ++ ++ ++

ALL RAILROADS TO BE ABANDONED \_\_\_\_\_ + + + + +

RAILROAD PROPERTY \_\_\_\_\_ [Pattern]

RAILROAD AND INDUSTRIAL PROPERTY \_\_\_\_\_ [Pattern]

PASSENGER STATION \_\_\_\_\_ [Pattern]

FREIGHT STATION \_\_\_\_\_ [Pattern]

COMBINED PASSENGER AND FREIGHT STATION \_\_\_\_\_ [Pattern]

FREIGHT YARDS \_\_\_\_\_ [Pattern]

SUBWAYS \_\_\_\_\_ - - - - -

ELEVATED RAILROADS \_\_\_\_\_ [Pattern]

BUS LINE \_\_\_\_\_ [Pattern]

PIPE LINE - GENERAL SYMBOL \_\_\_\_\_ - - - - -

GAS \_\_\_\_\_ - - - - -

CRUDE OIL \_\_\_\_\_ - - - - -

REFINED OIL \_\_\_\_\_ - - - - -

*From: "Suggested Symbols for Plans, Maps, and Charts," by the National Resources Committee.*

# SUGGESTED SYMBOLS FOR PLANS, MAPS, AND CHARTS




## TRANSPORTATION

### ROADS, HIGHWAYS, INTERSECTIONS, ETC.












**(1) ROAD CLASSES**

PRIMITIVE ROAD	_____	=====
UNIMPROVED ROAD	_____	=====
GRADED AND DRAINED ROAD	_____	=====
SOIL SURFACED ROAD	_____	=====
METAL SURFACED ROAD	_____	=====
BITUMINOUS SURFACED ROAD	_____	=====
PAVED ROAD	_____	=====





**ROAD SYSTEM DESIGNATION**

UNITED STATES HIGHWAY	_____	
STATE HIGHWAY (USE STATE'S SYMBOL)	_____	
FEDERAL AID HIGHWAY SYSTEM	_____	FAS
COUNTY HIGHWAY (USE COUNTY'S SYMBOL)	_____	

**INTERSECTIONS**

HIGHWAY INTERSECTIONS	EXISTING	PROPOSED
TRAFFIC CIRCLE		
CLOVER LEAF		
GRADE SEPARATION		
RAILROAD CROSSINGS		
GRADE CROSSING		
RAILROAD ABOVE		
RAILROAD BELOW		

**FUNCTIONAL TYPE**

FREEWAYS OR LIMITED WAYS	_____	=====
PARKWAYS	_____	=====
BOULEVARDS	_____	=====
OTHER PRIMARY ROUTES	_____	=====
SECONDARY ROUTES (IMPROVED)	_____	=====
BRIDLE PATHS	_____	=====
TRAILS AND FOOTPATHS	_____	=====
PARKING OVERLOOK		
PARKING AREA		

*From: "Suggested Symbols for Plans, Maps, and Charts," by the National Resources Committee.*

SUGGESTED SYMBOLS FOR PLANS, MAPS, AND CHARTS  
WATER RESOURCES




































	EXISTING	PROPOSED
DAMS		
RESERVOIR AREAS (a)		
FLOOD CONTROL		
POWER		
MUNICIPAL WATER SUPPLY		
IRRIGATION		
DRAINED AREAS		
IRRIGATED AREAS		
PUBLIC WATER SUPPLY		
SURFACE		
SHALLOW WELL		
DEEP WELL		
SPRING		
TREATMENT OF SUPPLY		
NO TREATMENT		
DISINFECTION ONLY		
PARTIAL TREATMENT		
COMPLETE TREATMENT		
WASTE DISPOSAL		
SEWER SYSTEM-NO TREATMENT		
SEWAGE DISPOSAL-PARTIAL TREATMENT		
SEWAGE DISPOSAL-COMPLETE TREATMENT		
INDUSTRIAL WASTE CONTROL		
ACID MINE DRAINAGE CONTROL, OIL FIELD BRINE CONTROL, OIL WASTE CONTROL, INDUSTRIAL WASTE CONTROL IN GENERAL.		
STREAM POLLUTION		
BACTERIAL CONTENT, THICKNESS OF LINE PROPORTIONAL TO CONTENT.		
HEAVY POLLUTION		
MEDIUM POLLUTION		
LIGHT POLLUTION		
HYDROELECTRIC PLANTS		

From: "Suggested Symbols for Plans, Maps, and Charts," by the National Resources Committee,

# SUGGESTED SYMBOLS FOR PLANS, MAPS, AND CHARTS

## CONSERVATION AND RECREATION

### TYPE OF AREA BY USES

	EXISTING	PROPOSED
FORESTS _____		
PARKS — OTHER THAN MUNICIPAL _____		
INDIAN RESERVATION _____		
INTENSIVE RECREATION AREAS _____		
MUNICIPAL PARKS _____		
CAMP GROUNDS _____		
PICNIC GROUNDS _____		
PLAYGROUNDS, BALL FIELDS, ETC. _____		
BATHING BEACHES _____		
BOAT LANDINGS _____		
SKI GROUNDS _____		
COUNTRY CLUB, GOLF COURSES _____		
FAIR GROUNDS _____		
SITES AND MONUMENTS _____		
GEOLOGIC AND BOTANIC _____		
HISTORIC AND ARCHAEOLOGIC _____		
SCENIC _____		
WILDLIFE AREA _____		
BIRD SANCTUARIES _____		
PUBLIC SHOOTING GROUNDS _____		
GAME FARMS _____		
GAME PRESERVES _____		
PUBLIC FISHING AREAS _____		
FISH PRESERVES _____		
FISH HATCHERIES _____		
MILITARY RESERVATIONS IN GENERAL _____		
MILITARY CEMETERY _____		
MILITARY HOSPITALS _____		

*From: "Suggested Symbols for Plans, Maps and Charts," by the National Resources Committee.*

## CONSERVATION AND RECREATION

## MISCELLANEOUS STRUCTURES

	EXISTING	PROPOSED
OPEN-AIR THEATRE _____		
INCINERATOR _____		
TABLE & BENCHES (PICNIC) _____		
FIREPLACE (OUTDOOR) _____		
COMFORT STATION _____		
MARKER, TABLET. _____		
CAMP GROUNDS _____		
GUARD RAIL (LOG) _____ + --- + --- + ---		
GUARD RAIL (STONE) _____ IIII --- IIII --- IIII		
RETAINING WALL _____		
HISTORIC BUILDINGS { RESTORED _____ H  B		
{ TO BE RESTORED _____ H  B		
{ TO REMAIN UNRESTORED _____ H  B		

*From: "Suggested Symbols for Plans, Maps, and Charts," by the National Resources Committee.*

## STANDARD GRAPHICAL SYMBOLS USED FOR RADIO


From the American Standards Association

1. Antenna		13. Galvanometer	
2. Antenna, Loop		14. Ground	
3. Ammeter		15. Inductor	
4. Arc		16. Inductor, Adjustable (by steps)	
5. Battery		17. Inductor, Variable	
6. { Capacitor, Fixed Condenser, Fixed		18. Inductor Iron Core	
<i>This symbol has not been approved as American Standard because in electric power and wiring (A.I.E.E. 1723-A.S.A. Z1025) and railway symbols (A.I.E.E. 1725-A.S.A. Z1025) the symbol is ———. At present these are irreconcilable.</i>		19. Jack	
7. Condenser, Fixed, Shielded		20. Key	
8. Condenser, Variable		21. Lightning Arrestor	
9. Condenser, Variable (with moving plate indicated)		<i>This symbol has not been approved as American Standard because in railway symbols (A.I.E.E. 1725-A.S.A. Z1025) the symbol is ———. At present these are irreconcilable.</i>	
-10. Condenser, Variable, Shielded		22. Loud Speaker	
11. Counterpoise		23. Microphone (Telephone Transmitter)	
12. Crystal Detector		24. Phototube	
		25. Piezoelectric Plate	
		26. Rectifier Tube, Full Wave (with cold cathode)	
		27. Rectifier Tube, Half Wave (with cold cathode)	

## STANDARD GRAPHICAL SYMBOLS USED FOR RADIO


From the American Standards Association

## 28. Resistor

This symbol has not been approved as American Standard because in electric power and wiring (A.I.E.E. 1725-A.S.A. Z1025) and electric power (A.I.E.E. 1725-A.S.A. Z1025) symbols the symbol is . At present these are irreconcilable.



## 29. Resistor, Adjustable (by steps)

This symbol has not been approved as American Standard because in railway symbols (A.I.E.E. 1725-A.S.A. Z1025) the symbol is . At present these are irreconcilable.



## 30. Resistor, Variable

This symbol has not been approved as American Standard for the reasons given in the basic symbol of above.



## 31. Spark Gap, Rotary



## 32. Spark Gap, Plain



## 33. Spark Gap, Quenched



## 34. Telephone Receiver



## 35. Thermoclement



## 36. Transformer, Air Core

This symbol has not been approved as American Standard because in electric power and wiring (A.I.E.E. 1725-A.S.A. Z1025) and railway (A.I.E.E. 1725-A.S.A. Z1025) symbols the windings are indicated thus



and for transformers having iron cores no parallel lines between windings are shown to indicate this. At present these are irreconcilable.



## 37. Transformer, Iron Core

This symbol has not been approved as American Standard for the reasons given in the basic symbol of above.



## 38. Transformer, With Variable Coupling

This symbol has not been approved as American Standard for the reasons given in the basic symbol of above.



## 39. Transformer, With Variable Coupling (with moving coil indicated)

This symbol has not been approved as American Standard for the reasons given in the basic symbol of above.



## 40. Voltmeter



## 41. Wires, Joined



## 42. Wires, Crossed, not joined



## Thermionic Tubes

## 43. Diode (or half-wave rectifier)



## 44. Rectifier Tube, Full-Wave (with directly heated cathode)



## 45. Triode (with directly heated cathode)



## 46. Triode (with indirectly heated cathode)



## 47. Tetrode (with directly heated cathode)



## 48. Screen Grid Tube (with directly heated cathode)



## 49. Screen Grid Tube (with indirectly heated cathode)



## 50. Pentode (with directly heated cathode)



## LOG OF EARLY DISCOVERIES ABOUT THE ELECTRON TUBE

